United States
Department of
Agriculture

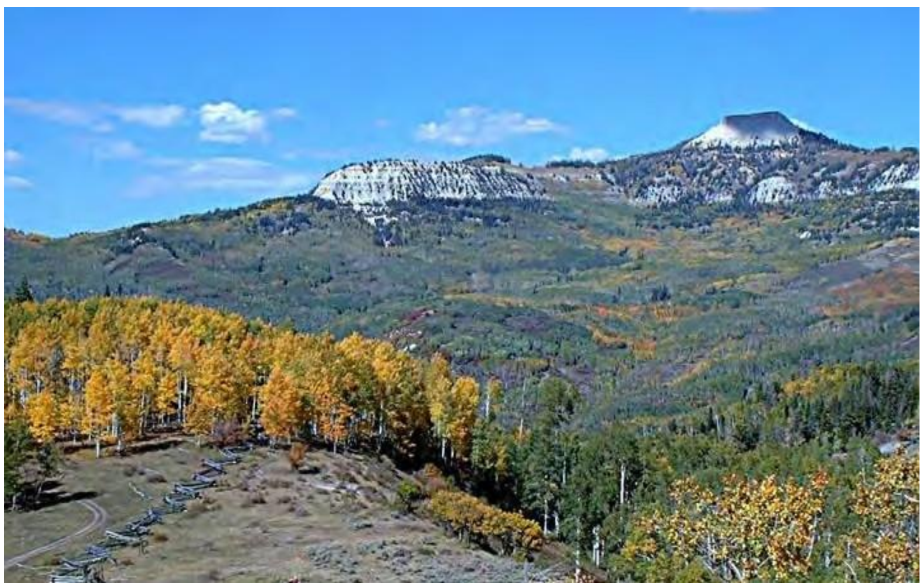
Forest
Service

August 2013

Record of Decision and Final Environmental Impact Statement

Oil and Gas Leasing Analysis

Fishlake National Forest, Utah
Beaver, Garfield, Iron, Juab, Millard, Piute, Sanpete, Sevier, and Wayne Counties, Utah



USDA Forest Service
Fishlake National Forest

Cooperating Agency:
USDI Bureau of Land Management

Cooperating Agency:
State of Utah

United States
Department of
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Service

Record of Decision

Lands Administered by the Fishlake National Forest

Oil and Gas Leasing

Beaver, Garfield, Iron, Juab, Millard, Piute, Sanpete, Sevier, and Wayne Counties, Utah

August 2013

Fishlake National Forest, Utah
Dixie National Forest, Utah

Cooperating Agencies:
Bureau of Land Management (BLM), Richfield Field Office
State of Utah, Governor's Office of Public Land Policy

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BACKGROUND

The Federal Onshore Oil and Gas Leasing Reform Act (P.L. 100-203) was enacted in 1987. The implementing regulations for the Bureau of Land Management (BLM[1]) were published in 1988 and the Forest Service regulations were published in 1990. The regulations describe the procedures by which each agency will carry out its statutory responsibilities in the issuance of oil and gas leases.

In the case of oil and gas resources under public domain land managed by the USDA Forest Service, the BLM is responsible for advertising and selling available leases, and for monitoring subsurface activities related to exploration and development. Their monitoring role includes administering all Federal regulations pertaining to subsurface oil and gas development.

The Forest Service has the authority and responsibility to determine which National Forest System lands are available for oil and gas leasing, and the specific lands which the BLM may offer for lease. The Forest Service is also responsible for prescribing lease terms that provide reasonable protection to surface resources and values, approving the lessee's Surface Use Plan of Operations (SUPO), and insuring that the requirements of the leases and operating plans are carried out according to their terms. The regulations applicable to the above are found in Title 36, Code of Federal Regulations, Part 228, Subpart E.

The Oil & Gas Leasing Analysis Environmental Impact Statement (EIS) for the Fishlake National Forest was prepared in response to the requirements of the implementing regulations for the Leasing Reform Act. All legally available National Forest System lands on the Fishlake National Forest (N.F.) have been included in the Analysis Area. In 2011, the Dixie National Forest issued a decision designating lands available for oil and gas leasing on lands administered by the Dixie National Forest. That decision did not include National Forest System lands in the former Teasdale Ranger District. Those lands are included in this decision and are administered by the Fremont River District Fishlake N.F. under the direction of the Dixie National Forest Land and Resource Management Plan (Dixie LRMP). The Oil & Gas Leasing EIS for the Fishlake National Forest also includes all legally available National Forest System lands of the Teasdale portion of the Fremont River Ranger District in the Analysis Area.

The purpose of this Record of Decision (ROD) is to document Forest Service decisions regarding which lands will be administratively available for oil and gas leasing in accordance with 36 CFR 228.102(d) and authorize the BLM to offer those specific lands for lease. This decision includes the lease terms and stipulations determined necessary to protect the surface resources based on disclosure of environmental effects in the Oil and Gas Leasing Final EIS (FEIS). This ROD also documents the decision to amend the Fishlake National Forest Land and Resource Management Plan (Fishlake LRMP) and Dixie LRMP by providing more specific direction related to leasing requirements on associated National Forest System lands determined to be administratively available for oil and gas leasing.

The regulations, 43 CFR 3101.7-2(c), which pertain to leasing of Federal lands administered by an agency outside the Department of Interior, require the BLM to review and accept all

[1]Definitions of acronyms used in this document can be seen in Section 5.2 of the FEIS.

reasonable leasing recommendations of the surface managing agency. In this case, these recommendations involve decisions on the administrative availability and authorization of specific lands for leasing, and stipulations needed to protect surface and subsurface resources within the Forest.

This ROD does not approve any ground disturbing activities. If lands are leased and the lessee proposes an Application for Permit to Drill (APD), only then would the agencies consider approval of proposed ground disturbing activities. Approval of ground disturbing activities would require a separate NEPA analysis and decision and compliance with other federal laws. If that additional site-specific analysis at the APD stage identifies issues or resources that warrant additional protection, the Forest Service can take full advantage of provisions included in the lease and stipulations to work with the lessee to protect forest resources.

DECISION

After carefully considering the administrative record of information, the applicable laws and regulations, the anticipated environmental impacts of the alternatives analyzed in the Final EIS, and the public's comments, we have selected Alternative C as presented in the Final EIS.

Our conclusions are based on the scientific analysis (and supporting project record) that demonstrates a thorough review of relevant scientific information, a consideration of responsible opposing views, and the acknowledgement of incomplete or unavailable information. The analysis identifies techniques and methodologies used, considers the best available scientific information, and references scientific resources relied upon. The analysis includes a summary of the credible scientific evidence relevant to evaluating reasonably foreseeable impacts.

Detailed Description of Our Decision, Including Stipulations and Lease Notices

Our decision will make approximately 1,707,810 acres of National Forest System land administratively available for oil and gas leasing and authorize the BLM to offer those specific lands for lease. These acres are administered by the Fishlake National Forest and include approximately 253,299 acres that are part of the Dixie National Forest (Teasdale portion of the Fremont River Ranger District). Oil and gas leases offered after this decision will include Standard Lease Terms (SLT&C) of the lease form, Lease Notices, and any stipulations identified as necessary for resource protection. The SLT&C, Lease Notices and other applicable stipulations are listed in Appendix A of the Final EIS. Table ROD-1 below displays the acreages available for leasing subject to the use of the stipulations governing Timing Limitation (TL), Controlled Surface Use (CSU), and No Surface Occupancy (NSO). Table ROD-2 summarizes the stipulations that will apply to each Resource. The FEIS also further defined each stipulation to provide the lessee with information or circumstances under which a waiver, exception, or modification would be considered. We are incorporating this direction into our decision. Our decision approves the amendment of the Fishlake LRMP and the Dixie LRMP as described in Appendices H and I of the FEIS to update management direction, the number of acres available, and leasing requirements associated with oil and gas leasing on lands administered by the Fishlake National Forest.

The location of the acres shown in Table ROD-1 is displayed on Figure ROD-1.

Table ROD-1. Approximate Acres Available For Leasing

Standard Lease Term or Stipulation	Acres
Standard Lease Term	62,468
CSU	209,120
TL	82,359
NSO	1,353,863
Total Administratively Available	1,707,810

CSU – Controlled Surface Use **TL – Timing Limitation** **NSO – No Surface Occupancy**

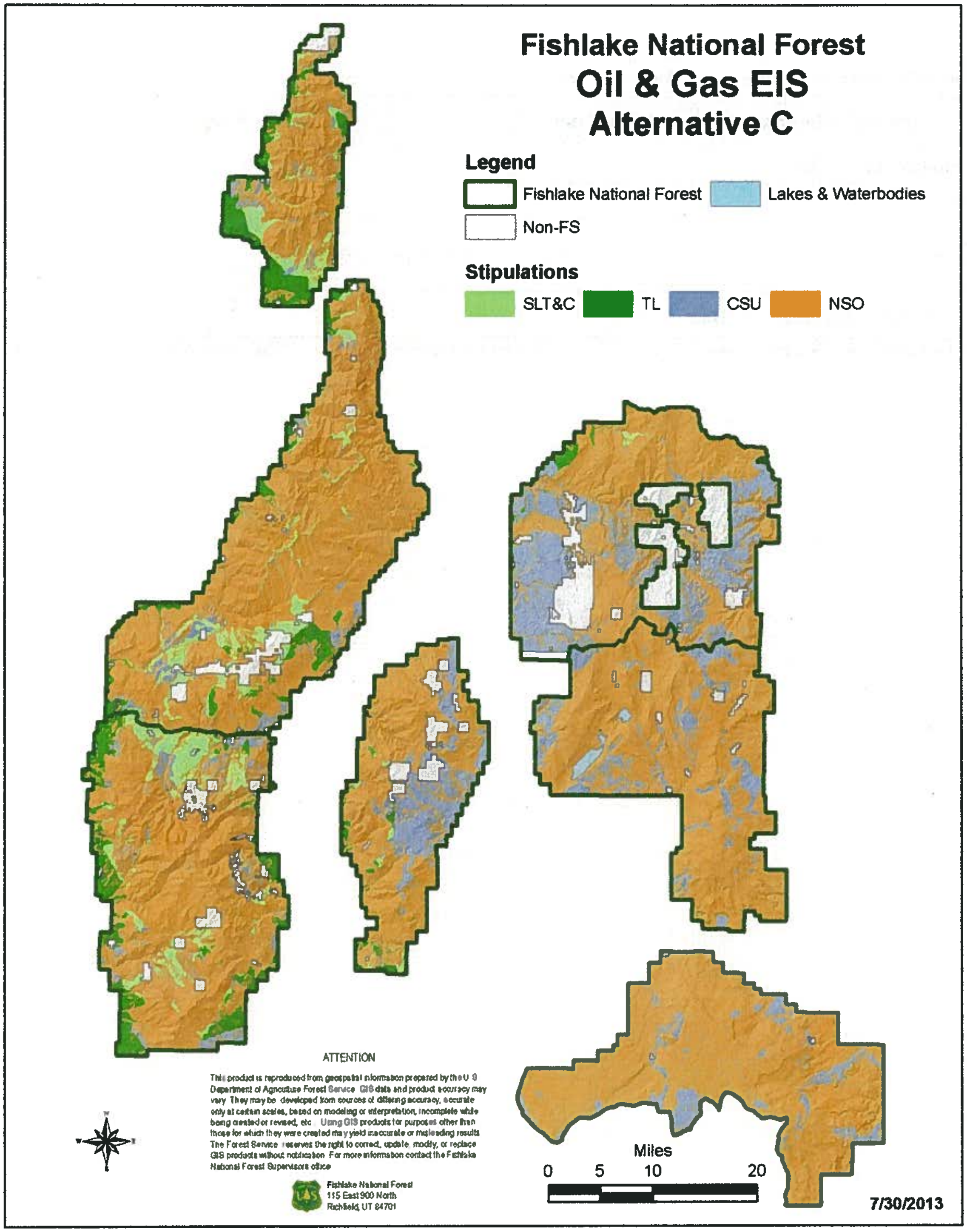

Figure ROD-1. Areas Administered by the Fishlake National Forest Available For Leasing by Stipulation

More detailed maps that show the specific resources that necessitate the use of the stipulations shown in Table ROD-2 are included in Appendix B of the FEIS.

Table ROD-2. Stipulations by Resource Area

Resource Area	Stipulation
Watershed resources	
Geologic hazards/unstable soils	NSO-01
Steep slopes >35 percent	NSO-02
Riparian areas	NSO-03
Delineated wetlands	NSO-04
Perennial streams, reservoirs, springs, and lakes	NSO-05
Drinking Water Source Protection Zone	NSO-06
Wildlife and Plant Species	
Threatened, Endangered, Proposed and Sensitive plants	NSO-07
Aquatic fauna	NSO-08
Greater sage-grouse leks	NSO-09
Pygmy rabbit colonies	NSO-10
Bald eagle winter concentration areas	NSO-11
Mexican spotted owl Protected Activity Centers	NSO-12
Goshawk core nest areas	NSO-13
Goshawk Post Fledgling Areas	CSU-01
Active Raptor nest areas	CSU-02
Bighorn sheep lambing areas, winter range, crucial elk calving and mule deer fawning	TL-01 & 03
Crucial elk winter range and calving areas and mule deer winter range	TL-02
Greater sage-grouse brood rearing habitat	TL-04
Greater sage-grouse winter habitat	TL-05
Crucial mule deer winter range and fawning areas	TL-01 & 02
Visual resources	
High Scenic Integrity areas	NSO-14
Inventoried Roadless Areas	
Inventoried Roadless Areas	NSO-15
Recreation	
Developed recreation sites and National Recreation Trails	NSO-16
Other Resources	
Research Natural Areas	NSO-17
Forest Service administrative sites and facilities	NSO-18
Cultural Resources, Old Spanish Trail, Paradise Valley, Quitchupah Canyon	NSO-19
Air quality	CSU-03

The NSO, TL, and CSU Stipulation requirements (FEIS Appendix A) serve to mitigate potential effects of Federal oil and gas activities. The lessee must accept these stipulations as conditions of purchasing the lease. These stipulations represent Forest Service decisions regarding the best means of avoiding or minimizing environmental impacts that may arise from the project while meeting the integrated resource management requirements of the Fishlake LRMP and Dixie LRMP.

Our decision also includes the following Lease Notices developed as part of this analysis (FEIS Appendix A). At a minimum, the following Lease Notices would be applied.

Table ROD-3 Lease Notices

Lease Notices by Resource Area
National Forest System Lands Under Jurisdiction of Department of Agriculture
Presence of Cultural Resources
Presence of Threatened and Endangered Species
Mexican Spotted Owl
California Condor
Western Yellow-billed Cuckoo
Utah Prairie Dog
Migratory Birds
Sensitive and Management Indicator Species (plants and wildlife)
Drinking Water Source Protection Zone
Air Resources

Rationale for Decision

We have reviewed the current environmental conditions, and the direct, indirect, and cumulative effects analyses for all actions proposed in each of the alternatives. We have also considered comments received from the public and other agencies. In making our decision, we considered:

- The degree to which each alternative met the purpose and need for action;
- The degree to which each alternative responds to significant issues; and
- The degree to which the alternative is responsive to public concerns and comments on the draft EIS (DEIS).

The discussion below details why we find that Alternative C best meets the purpose and need, responds to public concerns, and address resources issues.

Relationship to the Purpose and Need

The purpose and need for this proposal is to (1) decide which lands will be administratively available for oil and gas leasing in accordance with 36 CFR 228.102(d) and (2) determine what lease stipulations should be applied to which pieces of land to protect surface resources.

Alternative C includes lease terms and stipulations that we have determined are necessary to protect the surface resources. It makes significant acreage available for leasing while protecting surface and subsurface natural resource values. While the alternative allows leasing on all 1,707,810 acres of the Fishlake and Dixie National Forests lands administered by the Fishlake National Forest, it contains lease terms and stipulations that protect environmental features and ensure sustainability of the natural resources. In choosing Alternative C, we have weighed the need for resource protection with the desire to make oil and gas leasing possible and profitable.

Key Features of the Decision

In the following discussion, we lay out our reasoning behind choosing Alternative C with respect to key features of the decision and how they address resource issues. Alternative C was developed to respond to commenters looking to better balance the opportunity to lease with protection for inventoried roadless areas, riparian areas, water quality, air quality, and important wildlife habitat. These key features are the basis behind our determination that Alternative C addresses the key features the best.

Future exploration and development

As described previously in the ROD and more fully in the FEIS, this decision applies to areas that this decision makes administratively available for leasing. While it does not fully dictate how leased areas are explored and developed, it discloses restrictions and practices that are applicable. This decision on stipulations and lease notices and their applicability allows potential lessees to understand the restrictions and information that will be used to guide development. At this time, we do not know exactly where exploration and development may occur; therefore, we use stipulations to limit activities that will be allowed under a lease in order to protect the resources if an Application for Permit to Drill (APD) comes in for review.

Some members of the public would like the leasing decision to be more conservative and restrictive to cover all the potential eventualities. Our decision is based on the reasonably foreseeable development scenario, developed using the best available information. The analysis associated with this EIS will be reviewed for sufficiency at the time specific parcels are considered for leasing. Additional site-specific analysis will occur at the APD stage. Should issues or resources be identified at the APD stage warranting additional protection, the Forest Service will follow provisions of the stipulations and lease notices and work with the lessee to protect forest resources. This will include prudent use of a provision in 43 CFR 3101.1-2 which allows the surface management agency to require movement of proposed facilities up to 200 meters to avoid negatively affecting resources.

Environmental Issues Considered

Issues serve to highlight effects or unintended consequences that may occur from the proposed action and alternatives, giving opportunities during the analysis to reduce adverse effects and compare trade-offs for the decision maker and public to understand. The environmental issues considered are the key issues used in the environmental analysis to formulate alternatives, prescribe mitigation measures, and analyze environmental effects. Our selection of Alternative C takes into consideration the degree to which the alternative met the purpose and need for action, the degree to which the alternative responded to these key issues, and the degree to which the alternative is responsive to public concerns and comments on the draft DEIS.

Riparian areas, wetlands, steep slopes, and unstable soils

One concern identified by some respondents about future development is that riparian areas and wetlands, steep slopes, and unstable soils may not be adequately protected. In Alternative C, these areas are covered by the No Surface Occupancy (NSO) stipulation, which would not allow well pads or other structures. Temporary exploratory activities, if directional drilling is technically and economically feasible, would allow well pads and other structures to be placed outside the area covered by the NSO stipulation.

Inventoried Roadless Areas

Forest Service policy requires that projects in inventoried roadless areas (IRA) evaluate impacts on roadless characteristics and wilderness attributes for potential future wilderness suitability. As one way to insure that roadless characteristics and wilderness qualities and attributes would not be negatively affected, Alternative C places a NSO stipulation on all IRAs.

Some publics felt that this is not restrictive enough, and that all IRAs should not be made available for lease, while one cooperating agency felt we may be essentially restricting too much land from oil and gas development. We believe that the key element to maintain roadless characteristics and wilderness character is to limit the amount of surface disturbance, particularly long-term surface disturbance. Thus, in Alternative C, we used a NSO stipulation that restricts surface occupancy, while still allowing for exploration in the IRAs without the use of roads and potential development outside the IRAs to extract oil and gas from under the surface of the IRAs. With the NSO stipulation, we are able to allow directional drilling under IRAs from outside those designated areas.

At this time, the technology exists to use directional drilling to access some of the potential reserves in these areas. We recognize that directional drilling is less precise and more expensive than conventional drilling methods and not all of the areas can be reached with this method. Typically, with current technology, reserves can be reached by directional drilling up to approximately a mile from a well site. We believe our decision allows current and future oil and gas extraction in IRAs, while maintaining the integrity of the roadless and wilderness character.

Greater sage-grouse habitats

In the spring of 2010, the US Fish and Wildlife Service found that greater sage-grouse were warranted for listing under the Endangered Species Act, but precluded due to other species having higher priority. We factored this finding into our decision and chose Alternative C, because it provides the most protection for sage-grouse and their habitat, while still allowing for oil and gas leasing opportunities.

The stipulations in Alternative C protect all greater sage-grouse habitats with NSO and timing limitation (TL) stipulations. Sage-grouse leks will have the NSO stipulation applied to a distance of 4 miles from the lek. This 4 mile buffer is in accordance with the most current scientific recommendation, follows FS Interim Recommendations (Oct. 2, 2012) and is in keeping with the recommendations from U.S. Fish and Wildlife Service. In addition, a TL stipulation will ensure that brood-rearing and winter habitats are protected. In order to afford extra protection to sage-grouse, we adopted the most recent guidance applicable to oil field development. Because the projected development under this decision is minor compared to the areas where the guidance has been developed and because of stipulation application described above, we believe that the persistence of greater sage-grouse is ensured.

Aquatic resources including fisheries

Many of our public and agencies comments included requests for additional restrictions in areas influenced by water. Alternative C was developed, in part, to provide additional protection for these areas. The use of the NSO stipulation is applied within 300 feet of wetlands, riparian areas, lakes reservoirs, perennial streams, and springs. Additionally, the 200-meter offset provision contained in 43 CFR 3101.1-2 can be used to address additional site-specific issues that come up at the APD stage.

We fully recognize the importance of aquatic and riparian resources both in terms of our responsibility in managing the lands administered by the Fishlake National Forest and the public needs and desires. We believe that Alternative C protects those critical resource values while allowing development of oil and gas resources.

Groundwater protection from future exploration and development

Groundwater is protected through BLM ground water protection measures and through lease stipulations and lease notices in the FEIS. The BLM regulates the exploratory and development well drilling and provides protection of groundwater through a planning process, implementation of lease stipulations and lease notices, BLM regulations, Onshore Oil & Gas orders, the Gold Book, mitigation, and monitoring. In Utah, the BLM utilizes Instruction Memorandum No. UT 2010-055 regarding Protection of Ground Water Associated with Oil and Gas Leasing, Exploration and Development – Utah BLM, dated July 20, 2010. In making our decision, we have reviewed the ground water protection measures described in the FEIS in section 3.9 Water Resources including Culinary and Municipal Water Systems, Surface, and Ground Water. In Alternative C, the lease stipulation that applies to groundwater protection is NSO in Drinking Water Protection Zones.

Cultural and historical resources protection

Several comments were received relative to the responsibility of the Forest Service to comply with National Historic Preservation Act (NHPA) and Executive Order 11593 and the importance of protecting cultural and historical resources within the project area. This responsibility is recognized as documented in the FEIS Section 1.9.2 (3). The decision on leasing is programmatic in nature and does not authorize specific projects. After leasing is authorized but before a specific project is permitted the process outlined by Section 106 of the National Historic Preservation Act (36 CFR part 800) will be followed. This process requires discovery, evaluation and consultation with the Utah State Historic Preservation Officer (USHPO) on National Register eligibility related to cultural and historical resources in the project area and, if needed, determines what must be done to avoid, minimize or mitigate project effects on significant sites.

This decision proactively protects any cultural resources within the project area through a lease notice, stipulation and SLT&C that will be required where applicable.

Specific comments were received relative to protection of the "Old Spanish Trail." We provide protection or avoidance of this and other known significant sites with their associated buffer zones after consultation with the USHPO through No Surface Occupancy Stipulation #19.

Response to Key Issues

Using the scoping comments from the public and other agencies, the Forest Service Interdisciplinary Team (IDT) developed the following list of key issues, defined as those issues directly or indirectly caused by implementing the Proposed Action. Significant issues are issues used to formulate alternatives to the Proposed Action, prescribe mitigation measures, or analyze environmental effects.

Our decision addresses and resolves the significant issues in the following ways:

<u>Issue #1: Wildlife Resources</u> – Activities associated with post-leasing oil and gas exploration and development could cause detrimental impacts to wildlife, including threatened, endangered, proposed, sensitive, migratory birds, and MIS. These impacts could include decreased security due to increased access, displacement, disruption of breeding and rearing of young, death of individuals, direct habitat loss, decrease to population trends, habitat fragmentation, and conflict with existing conservation agreements.

Response: The FEIS includes updated mapping of habitat for many key wildlife species. In Alternative C, Mexican spotted owl, bald eagle, sage-grouse, pygmy rabbit, goshawk, and boreal toad are all protected with a NSO stipulation. MIS are protected with stipulation or lease notices. A TL stipulation will be used to protect key habitat types such as crucial bighorn sheep, elk and mule deer winter ranges, bighorn sheep lambing, elk calving, and deer fawning ranges. The TL stipulation will restrict operations during critical times for wildlife. In addition, Lease Notices have been developed which put the lessee on notice that in habitats for threatened, endangered, sensitive, and other protected wildlife and plant species, they may have to survey and accept additional protection measures at the APD stage. Raptor nest sites as well as goshawk post-fledgling family areas are protected with a CSU stipulation.

The lands administered by the Fishlake National Forest include areas of priority and general sage-grouse habitat. Sage-grouse leks, brood-rearing habitat, and winter habitat are protected with NSO and TL stipulations.

When the current Utah Sub-Regional Greater Sage-Grouse RMP Amendment (Sage-Grouse Amendment) EIS is completed, all Utah forest plans will be amended to be compliant with the Sage-Grouse Amendment Record of Decision. If inconsistency occurs between the Fishlake N.F. Oil and Gas ROD and the Sage-Grouse Amendment ROD, amendments will be made to this decision so that it is consistent with the Sage-Grouse Amendment ROD.

<u>Issue #2: Unroaded/Undeveloped Areas (UUA)</u> – Activities associated with post-leasing oil and gas exploration and development could potentially change wilderness quality (intrinsic wilderness attributes brought forth from the Wilderness Act of 1969) of unroaded/undeveloped areas which are generally outside of but contiguous to an Inventoried Roadless Area.

Response: The selected alternative requires stricter environmental controls than Alternative B while still allowing for possible oil and gas exploration and development. It provides a better balance of surface resource protection while still making the land available for extraction of oil and gas resources than Alternative D. Although the SLT&C provide for significant protection of resources, the selected alternative places a much greater portion of lands administered by the Fishlake N.F. into a NSO status.

Issue #3: Visual and Scenic Integrity – Activities associated with post-leasing oil and gas exploration and development could degrade the scenic integrity of the Forest and cause a decrease in visitation and forest use.

Response: The decision places a NSO stipulation on frequently viewed areas that have high scenic integrity. Compliance with the NSO stipulation would preclude scenic integrity degradation resulting in few if any changes to visitation and forest use.

Areas of high scenic integrity were determined by developing Scenic Integrity Objectives (SIO) following methods consistent with direction in current FS manuals and handbooks. Maps illustrating the objectives are contained in Appendix B of the FEIS.

SIO were developed for the analysis of effects of oil and gas leasing on visuals They are consistent with the SMS system identified in Dixie Forest Plan Amendment #15 (Scenery Management System Non-Significant Amendment of the Dixie National Forest Land &Resource Management Plan) yet more refined because topographic features are used rather than buffers around transportation corridors and sensitive viewsheds. Current science and techniques using viewsheds were employed. Consistent analysis is provided with scenery management processes used on the National Forest System land administered by the Fishlake N.F. The analysis and stipulations to protect scenic integrity are consistent with the Dixie N.F. for the Teasdale Unit.

A majority of the sensitive scenic areas with potential for lease would not be seen while traveling on important routes, to or from Capitol Reef National Park, scenic byways, or to or from major communities. They are either not available for lease or are effectively screened by topography so as not to be readily apparent in linear view for an extended duration as seen by travelers.

Exploration and development actions can be appropriately designed and mitigated at the APD stage so that any activity associated with future exploration and development would meet appropriate SIO in both the intermediate and long terms.

Issue #4: Geologic Hazards and Steep Slopes – Ground-disturbing activities associated with oil and gas exploration and the subsequent development of roads, pipelines, and production fields may cause a decrease in slope stability within large areas of steep to very steep terrain. This could result in accelerated rates of soil erosion with rapid runoff events followed by a partial sedimentation of our local water bodies.

Response: The decision places a NSO stipulation on slopes greater than 35 percent, on North Horn sediment areas greater than 25 percent slope, and on areas with geologic hazards or unstable slopes. SLT&C requirements for application of Best Management Practices would prevent or minimize erosion and subsequent potential deposition of soil into water bodies. Construction of roads, pipelines and other similar facilities will be evaluated at the APD stage and must comply with direction from the Dixie or Fishlake LRMP. These actions would eliminate unacceptable soil loss and associated impacts on water quality.

Issue #5: Water Quality – Activities associated with post-leasing oil and gas exploration and development could cause adverse impacts to ground water and surface water.

Response: NSO stipulations protect the following areas and within 300 feet of them: riparian areas, wetlands, lakes, reservoirs, perennial streams, and springs. Exploration and development activities on future leases will be evaluated at the APD stage, and further protection measures such as Conditions of Approval, BMPs, and provisions in the Standard Lease Terms can be used for further protection as appropriate. Drinking Water Source Protection Zones are delineated by the State of Utah. Protecting them is critical for maintaining clean safe water for human consumption. No surface occupancy will be allowed in Zones 1-3, and Transient (T) Zones T2 and T4.

Issue #6: Fisheries – Activities associated with post-leasing oil and gas exploration and development could cause an increase in sedimentation and otherwise degrade cold water aquatic habitat and watershed conditions, resulting in changes in habitat, food production, and declining recruitment of trout, and reduce the sustainability of native trout populations.

Response: Alternative C places a NSO stipulation on all perennial waters within 300 from the water's edge. Current literature shows that overland sediment transport distances increase with slope, and decrease with the complexity of the riparian buffer zone. However, overland flows rarely transport sediment more than 300 feet even on 47 percent and steeper slopes. Therefore, a 300 foot riparian buffer is capable of controlling overland sediment flows on most slopes and would therefore adequately protect resident trout and their habitat from overland sediment movement resulting from new roads built for oil and gas development.

Issue #7: Vegetation – Activities associated with post-leasing oil and gas exploration and development could cause individual endangered, threatened, sensitive, and/or MIS plants or plant populations to be negatively impacted. Noxious weed populations could increase as a result of ground disturbance associated with oil and gas exploration and development.

Response: Alternative C requires no surface occupancy within one mile of known federally Threatened, Endangered, or Proposed plant populations nor within 1 mile of Sensitive plant locations covered under a conservation agreement.

The NSO stipulation greatly reduces the potential for impacts to these species as lands known to support them will not be affected by surface disturbance. Plant species of concern are further protected by the attachment of a Lease Notice that requires survey for sensitive and MIS plants prior to any ground disturbing activities at the APD stage. We believe these measures adequately protect this resource.

The Fishlake and Dixie National Forest have specified operation and reclamation standards for lands we administer that mitigate noxious weed increase due to oil and gas exploration and development. These standards are detailed in Appendix F of the FEIS.

Issue #8: Air Quality – Activities associated with post-leasing oil and gas exploration and development could result in emitting atmospheric pollutants including fine particulates, NOx, and volatile organic compounds, degrading air quality.

Response: The anticipated effects of post leasing exploration, development and production on air quality are also discussed in the FEIS. Analysis of these effects essentially followed the process outlined in the Memorandum of Understanding (MOU) Regarding Air Quality Analysis and Mitigation for Federal Oil and Gas Decisions through the National Environmental Policy Act Process (June 23, 2011). The analysis included collaboration with the EPA and other federal government agencies and used modeling processes prescribed in the MOU. Air quality goals have been met by requiring protective measures of the Oil and Gas Construction and Operating Standards and Well Site Design Requirements (Appendix C of the Final EIS), CSU – 03, and a

Lease Notice. Direction for further analysis of impacts to mitigation measures for air quality will also be required for any future exploration, development and production.

Issue #9: Social/Economic – Lack of opportunities to lease federal land for oil and gas exploration and development could cause a shortage of domestic oil and gas supplies, and result in high prices for gas and oil. A shortage of domestic oil and gas supply results in dependence on foreign energy supplies.

Response: Our decision allows for the generation of individual income through oil and gas resource exploration and development. It also would provide for additional income to associated counties if leasing occurs. Our review indicates the lands available for leasing will allow for development at the reasonably foreseeable level. We believe given the likely level of development that has been predicted, an appropriate balance between revenue and resource protection is achieved. Alternative C allows economic benefits from oil and gas resources, and potential oil and gas supply while protecting other uses of the forest that also bring economic benefits to the area.

Consideration of DEIS Comments in the Rationale for the Decision

Eight letters were received during the DEIS comment period. All letters were reviewed by us and the interdisciplinary team members. Individual letters are on file in the project record at the Fishlake National Forest Supervisor's Office.

In reviewing the comments received on the DEIS, we believe that our decision addresses the concerns raised by the public. Of the 8 comment letters received, the primary concerns expressed were about wildlife, air quality, water quality, and cultural resources (specifically the Old Spanish Trail). All public comments are responded to in detail in Appendix G of the FEIS. In our rationale above, we discussed how our decision responded to specific comments from the public and cooperating agencies. While this decision will not satisfy all of the commenters, we believe it does respond best to the suite of comments we received.

Cooperating Agencies and Our Decision

There were two cooperating agencies designated at the onset of this project. The cooperating agencies that have been identified and their respective roles are the BLM (Jurisdictional) and State of Utah (Special Expertise). The State of Utah played a valuable role in representing their constituents. The BLM has shared jurisdiction in the leasing of Federal minerals. We believe cooperating throughout this process we eliminated redundancy in our processes and increased the success of applying environmentally sound techniques to oil and gas operations on the Forest in the future.

Conclusion of Rationale for Our Decision

Alternative C allows leasing on a significant portion of the lands administered by the Fishlake National Forest and contains lease terms and stipulations that protect surface resources and ensure sustainability of the natural resources. In choosing Alternative C we have weighed the need for resource protection with the desire to make oil and gas leasing possible and profitable in keeping with the Forest Service national policy on minerals (FEIS pg. S-1).

Among other issues comments on the draft EIS were concerned with the range of alternatives analyzed. Alternative C was developed to respond to commenters looking to better balance the opportunity to lease with protection for roadless areas, riparian areas, and important wildlife habitat. Alternative C provides significantly more environmental protection measures while allowing leasing on the same number of acres as Alternative B. Alternative C provides the same protection for inventoried roadless areas as Alternative D but our decision allows access to the subsurface resource. We believe that our decision has achieved that balance therefore it best meets the concerns of the Forest Service and the public to allow leasing and protect surface and subsurface resources.

Alternative B would allow leasing on the same number of acres as Alternative C. However, based on the analysis in the FEIS, we found that it does not provide as well for protection of key resource features such as inventoried roadless areas, aquatic resources, and wildlife habitat.

Alternative D would not allow leasing in inventoried roadless areas. In fact, under Alternative D, over 1.2 million acres (72.6% of the Forest land) would not be available for leasing at all. Under Alternative C all National Forest System land would be open for leasing and the surface resources including inventoried roadless areas would be protected through stipulations, lease notices and SLT&C. While we have a responsibility to protect the environment, we felt that Alternative D was more stringent than legally or environmentally necessary for protection of IRA values. Alternative D did not place any protection on sage-grouse habitat. We did not feel this was adequate protection given the recent finding by U.S. Fish and Wildlife Service that greater sage-grouse were warranted but precluded from listing under the Endangered Species Act.

PUBLIC INVOLVEMENT PROCESS

The NOI for this EIS was published on July 7, 2006 in the Federal Register, Volume 71, No. 130, pages 38602 – 38604. The publication of the NOI initiated the formal 45-day scoping period. The project has been listed in the quarterly SOPA since April 1, 2006.

A public breakout session regarding the oil and gas leasing analysis and preparation of this EIS was conducted during the Dixie and Fishlake Forest Plan Forum on June 28, 2006.

A legal notice was published in the Richfield Reaper on July 5, 2006. News releases with project scoping information were also published in several supplemental publications in June 2006, including the Garfield County Insider, Millard County Chronicle Progress, Richfield Reaper, and Wayne County Insider. Letters were sent to 250 individuals and organizations, and six public meetings were conducted in Beaver, Fillmore, Junction, Loa, Richfield, and Salina, Utah. Due to the time lapse between initial scoping and release of a DEIS, a Corrected NOI was published January 18, 2011 in the Federal Register, Volume 76, No. 11, pages 2881 – 2882.

A Notice of Availability was published in the Federal Register on October 21, 2011 for the DEIS, commencing the 45 day formal comment period, which concluded on December 5, 2011. After receiving comments about not having access to the air quality monitoring report which is referenced in the DEIS, the Fishlake National Forest made the document available and issued a Notice of Availability in the Federal Register on February 17, 2012 to extend the formal comment period for another 45 days.

ALTERNATIVES STUDIED IN DETAIL

Four alternatives are considered in detail (FEIS Chapter 2). Alternative C was developed in consideration of comments received during the scoping period.

Alternative A (No Action/No Lease)

No lands would be available or authorized for oil and gas leasing. This constitutes the no action alternative as well as a no lease alternative (FEIS Section 2.2.1 on pg. 28).

Alternative B

Under Alternative B (FEIS Section 2.2.2 on pg. 30) the total land administratively available for leasing is approximately 1,707,810 acres. All of the land administratively available would be authorized for lease under this alternative. STL&C would apply on 878,369 acres (about 51% of the land available). The CSU stipulation would apply on 827,775 acres, or about 49% of the available land. Alternative B places the NSO stipulation on about 1,665 acres, less than 1% of the available land.

Alternative C (Proposed Action)

The total land administratively available for leasing under Alternative C (FEIS Section 2.2.3 on pg. 32) is approximately 1,707,810 acres. All of the land administratively available would be authorized for lease with 62,468 acres (3.7%) under SLT&C, about 82,359 acres (4.8%) under a TL stipulation, 209,120 acres (12.2%) under a CSU stipulation, and 1,353,863 acres (79%) under a NSO stipulation.

Alternative D ("SMU" Alternative)

The total land administratively available for leasing under Alternative D (FEIS Section 2.2.4 on pg. 35) is approximately 1,707,810 acres. About 1,239,352 acres (73%) would not be authorized for lease under this alternative. These acres include all IRAs. About 32,002 (2%) acres would be leased under SLT&C. A CSU stipulation would apply on about 27,714 acres (1%), and 408,740 acres (24%) would be under a NSO stipulation.

ALTERNATIVES CONSIDERED BUT NOT STUDIED IN DETAIL

As a result of comments made during the initial scoping period, the following alternative was considered and then dismissed from detailed analysis for the following reasons:

An alternative that would make all legally open lands available for leasing with the NSO stipulation was considered but dismissed. Consideration of the NSO stipulation for specific areas was included in some of the action alternatives. A Forest-wide NSO alternative would not be reasonable or justified for all areas administered by the Fishlake National Forest, nor would it be consistent with national and Forest Service policy on minerals exploration and development.

SIGNIFICANCE OF FOREST PLAN AMENDMENTS

The "significance" of an amendment must be determined. It is important to note that there is a difference between "significance" of the change to a forest plan and "significance" of the environmental impacts of the Proposed Action as defined by the Council on Environmental Quality (CEQ).

These forest plan amendments were developed during the planning rule transition period pursuant to 36 CFR 219.17(b)(3), which allows use of the provisions of the prior planning regulation, including its transition provisions (36 CFR 219, published at 36 CFR parts 200 to 299, revised as of July 1, 2010). Under the transition provisions, our determination of "significance" for a forest plan amendment is based on the following criteria defined in the Forest Service Manual 1920, section 1926.52, per Regional Forester letter dated August 9, 2007:

1. Changes that would significantly alter the long-term relationship between levels of multiple-use goods and services originally projected.

   The amendment to the Fishlake LRMP will not significantly alter the levels of multiple-use goods and services projected in the Fishlake LRMP, Chapter 4, Section C. The amendment changes the number of acres available for oil and gas leasing on lands administered under the Fishlake LRMP to approximately 1,454,511 acres. The amendment makes no changes to affect other goods and services. The amendment will not significantly alter the long-term relationship between levels of multiple-use goods and services projected in the Fishlake LRMP, Chapter 4, Section C.

   The amendment to the Dixie LRMP changes the number of acres available for oil and gas leasing on the Dixie National Forest from 1,478,227 acres to 1,731,526 acres. This change is from the addition of acreage located on the Teasdale portion of the Fremont River Ranger District. The amendment makes no changes to affect other goods and services. The amendment will not significantly alter the long-term relationship between levels of multiple-use goods and services projected in the Dixie LRMP, Chapter 5, Section C.

2. Changes that may have an important effect on the entire land management plan or affect land and resources throughout a large portion of the planning area during the planning period.

   The amendment designates 1,454,511 acres of lands administered under the Fishlake LRMP as administratively available for leasing under specific resource protecting stipulations. If the entire gross surface disturbance estimated in the Reasonably Foreseeable Development Scenario were to occur over the next 15 years, including well pads, production facilities, pipelines and powerlines, there would be approximately 1420 acres of disturbance prior to reclamation, approximately 1035 of the acres managed under the Fishlake LRMP.

   The amendment designates an additional 253,299 acres of lands available for leasing under specific resource protecting stipulations managed under the Dixie LRMP. These acres account for less than 15% of the acres administered under the Dixie LRMP. They are in addition to the 1,478,227 acres of lands administered by the Dixie National Forest previously determined to be administratively available for leasing under specific resource protecting stipulations (Dixie National Forest Oil and Gas Leasing ROD, 8/23/2011). If the entire gross surface disturbance estimated in the Reasonably Foreseeable Development Scenario were to occur over the next 15 years, including well pads, production facilities, pipelines, and powerlines, there would be approximately 1420 acres of disturbance prior to reclamation, approximately 385 of the acres managed under the Dixie LRMP.

Based on the criteria in Forest Service Manual 1920, Chapter 1926.52, our determination is that the amendment to the Fishlake LRMP is not significant, and the amendment to the Dixie LRMP is not significant.

FINDINGS OF CONSISTENCY WITH LAWS, REGULATIONS, & POLICY

Numerous laws, regulations, and agency directives require that our decision be consistent with their provisions. Our decision is consistent with all laws, regulations and agency policy relevant to this project. The following discussion is intended to provide information on the regulations that apply to areas raised as issues or comments by the public or other agencies.

The National Forest Management Act of 1976 (PL-94-588)
Management activities are to be consistent with the Forest Plan [p16 USC 1604 (i)]. The Forest Plan guides management activities [36 CFR 219.1(b)]. Our decision to implement Alternative C is consistent with the intent of the Dixie and Fishlake Forest Plans' forest-wide goals and objectives. Our decision and Forest Plan Amendment Numbers 17 (Fishlake LRMP) and 25 (Dixie LRMP) do not change any Forest Plan goal or objective, nor does it alter any management area boundary. Our decision meets the direction, standards and guidelines of the Forest Plan as is documented in the EIS and project record.

Endangered Species Act (ESA)
Wildlife and fisheries biologists and plant ecologists evaluated Alternative C with regard to threatened and endangered animal and plant species. Findings are summarized in Chapter 3 of the FEIS and in the Biological Assessment (BA).

Formal consultation was completed with the USDI Fish and Wildlife Service, and a Biological Opinion was issued January 19, 2012. The opinion issued was that the proposed action was not likely to jeopardize the continued existence of the five threatened and endangered animal and plant species that are or may be found in the analysis area.

Lease notices for federally listed species were incorporated into the proposed action and are part of the decision to preclude or minimize adverse effects to these species and to meet the conditions of the biological opinion. Based on these measures and the threatened and endangered animal and plant species analysis in Chapter 3, we have concluded that the decision is consistent with the Endangered Species Act.

Migratory Bird Treaty Act (Executive Order 13186)
On August 1, 2007, the National Forests in Utah formalized an updated state-wide strategy for addressing migratory birds in USFS planning and project documents. The bird species selected for this analysis were derived from a compilation of species included in the Utah Partners in Flight Conservation Strategy, the Utah Comprehensive Wildlife Conservation Strategy, and the USFWS' Birds of Conservation Concern bird lists. On December 8, 2008, the Chief of the USFS signed a national-level memorandum of understanding with the Director of USFWS. The Final EIS analysis regarding migratory birds is compliant with the terms of that memorandum. Oil and gas leasing on the Fishlake N.F. with BMPs properly implemented, including appropriate

surveys and mitigations (of the location) prior to disturbance, is in compliance with the Migratory Bird Treaty Act and Executive Order 13186.

Executive Order 13186 of January 10, 2001
A lease notice included in our decision informs operators that surveys for nesting migratory birds may be required during migratory bird breeding season whenever surface disturbances and/or occupancy is proposed in association with fluid mineral exploration and development within priority habitats. Based on the result of the field survey, the authorized officer will determine appropriate buffers and timing limitations. Our decision is in compliance with this Executive Order for the Conservation of Migratory Birds.

Clean Water Act
NSO stipulations outlined in Appendix A of the FEIS and incorporated into the Forest Plans in Amendments 17 (Fishlake LRMP) and 25 (Dixie LRMP), which we have adopted as part of our decision, are designed to minimize impacts to soil productivity and protect water quality. All permits required by this Act and associated management agencies will be obtained. Based on these measures and the Soil and Water Quality analysis in Chapter 3, we have concluded that the decision is consistent with the Clean Water Act.

Executive Order 11990 of May 1977
This order requires the Forest Service to take action to minimize destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands. In compliance with this order, Forest Service direction requires that an analysis be completed to determine whether adverse impacts would result.

Wetlands within the project area were identified. A NSO stipulation was applied to the selected Alternative expressly for the purpose of protecting wetlands relative to this executive order. Our decision is in compliance with EO 11990.

Executive Order 11988 of May 1977
This order required the Forest Service to provide leadership and take action to (1) minimize adverse impacts associated with occupancy and modification of floodplains and reduce risk of flood loss, (2) minimize impacts of floods on human safety, health, and welfare, and (3) restore and preserve natural and beneficial values served by floodplains.

Smaller mountain streams, like those on lands administered by the Fishlake National Forest, are often constrained by geology and have narrow floodplains that may be contained entirely within the riparian area. As a result, they would generally be protected by NSO stipulations that have been applied to riparian areas. Our decision is in compliance with EO 11988.

Environmental Justice and Civil Rights
Executive Order 12898, issued in 1994 ordered Federal Agencies to identify and address any adverse human health and environmental effects of agency programs that disproportionately impact minority and low-income populations. Impacts of this project on local populations and economies are reviewed in Section 3.13 of the FEIS. Given existing populations and expected impacts, leasing federal land and developing associated oil and gas reserves in the area would not disproportionately impact any human populations. The Civil Rights Act of 1964 provides for non-discrimination in voting, public accommodations, public facilities, public education, federally assisted programs, and equal employment opportunity. Title VI of the Act, Non-discrimination in Federally Assisted Programs, as amended (42 US.C. 2000d through 2000-d6) prohibits discrimination based on race, color, or national origin. Our decision identifies lands available for

leasing and those stipulations necessary for protection of non-mineral resources. Actual leasing of federal resources with associated development and production is administered by the BLM who is under the same requirements to provide non-discrimination. This decision complies with the Civil Rights Act.

American Antiquities Act of 1906 and National Historic Preservation Act of 1966

The Forest Service has made the determination that this proposed undertaking will result in No Historic Properties Affected [36CFR 800.4(d) (1)]. No surface occupancy stipulations will protect existing cultural and historical resources. In addition, lease notices dictate surveys are conducted prior to ground disturbing activities and if cultural resources are encountered mitigation measures protecting these resources will be required. Based on these measures and the cultural resources analysis in Chapter 3, we have concluded that the decision is consistent with the American Antiquities and National Historic Preservation Acts.

Executive Order 13112, Invasive Species, February 3, 1999

This Executive Order directs Federal Agencies, whose actions may affect the status of invasive species, to (i) prevent the introduction of invasive species, (ii) detect and respond rapidly to, and control, populations of such species in a cost-effective and environmentally sound manner, as appropriations allow. The operation and reclamation standards detailed in Appendix F of the FEIS mitigate noxious weed increase due to oil and gas exploration and development. Our decision is in compliance with EO 13112.

Energy Policy Act of 2005 (Public Law 109-58)

Development of reliable domestic sources of energy is encouraged under Public Law 109-58. Dixie LRMP forest-wide goal of minerals management include "to administer the mineral resources of the Forest to provide for the needs of the American people and to protect and conserve other resources (Dixie LRMP pg. IV-9). Fishlake LRMP forest-wide goal of minerals management includes "Encourage mineral exploration, development and extraction consistent with management of surface resources (Fishlake LRMP pg. IV-5). We find our Decision is consistent with Public Law 109-58.

ENVIRONMENTALLY PREFERABLE ALTERNATIVE

When considered within the geographic scope of this analysis, Alternative D is the environmentally preferred alternative. There would be no new leasing on 1,239,352 acres of the Forest under Alternative D. Additionally in Alternative D the acres that are available for leasing would be leased under protective stipulations.

CEQ regulations (40 CFR 1505.2 (c) direct the decision maker to state whether all practicable means to avoid or minimize environmental harm from the alternative selected have been adopted, and if not, why they were not.

The selected alternative of Alternative C minimizes environmental harm from action due to the large amount of the Forest where NSO stipulations would be applied. The variety of stipulations prescribed for the remaining portion of the Forest minimizes environmental harm to the biological and cultural resources.

IMPLEMENTATION

The decision identified in the Record of Decision shall be implemented in the following manner:

1. If no appeal is received, implementation of this decision may occur on, but not before, five business days from the close of the appeal filing period. If an appeal is received, implementation may not occur for 15 days following the date of appeal disposition.

2. In accordance with 36 CFR 228.102(d), we shall notify the BLM as to the leasing decisions that we have made.

3. In accordance with 36 CFR 228.102(e), this environmental analysis will be reviewed when specific parcels are considered for leasing, and the BLM will be authorized to offer specific lands for lease subject to:

(a) Verifying that oil and gas leasing of specific lands has been adequately addressed in a NEPA document and is consistent with the Forest Plan,
(b) Ensuring that conditions of surface occupancy identified in the NEPA document are included as stipulations in resulting leases, and
(c) Determining that operations could be allowed somewhere on each lease, except where stipulations will prohibit all surface occupancy.

4. If the lands in the parcels do not receive a bid at a sale, they will be available for non-competitive offers for a two-year period.

5. Following lease issuance, a lessee/operator may submit an Application for Permit to Drill (APD) and Surface Use Plan of Operations (SUPO). A lessee/operator may not conduct on-the-ground actions without an approved APD and SUPO. The BLM will forward the APD and the SUPO to the Forest Service. An environmental analysis will be conducted on the APD and SUPO proposal. The APD and SUPO decisions are not being made in this Record of Decision. The Deciding Officers of that environmental analysis may (a) Approve the plan as submitted, (b) Approve the plan subject to specific conditions of approval; or (c) Disapprove the plan with stated reasons (36 CFR 228.107).

APPEAL PROCEDURES

This decision is subject to the administrative appeal procedures ("optional appeal procedures") available during the planning rule transition period pursuant to 36 CFR 219.17(b)(3), which allows use of the provisions of the prior planning regulation, including its transition provisions (36 CFR 219, published at 36 CFR parts 200 to 299, revised as of July 1, 2010). As allowed under the transition provisions at 36 CFR 219.35(b) of the prior planning regulation, the responsible officials have chosen to use the optional appeal procedures described in Appendix A to Section 219.35 of the prior planning regulation and published at 54 FR 3357 (January 23, 1989), as amended at 54 FR 13807 (April 5, 1989); 54 FR 34509 (August 21, 1989); 55 FR 7895 (March 6, 1990); 56 FR 4918 (February 6, 1991); 56 FR 46550 (September 13, 1991); and 58 FR 58915 (November 4, 1993).

Pursuant to 54 FR 3357, other than Forest Service employees, any person or any non-Federal organization or entity may challenge this decision and request a review by the Forest Service line officer at the next administrative level. The reviewing officer for this decision is the Regional Forester, Region 4.

Any notices of appeal must be fully consistent with the optional appeal procedures as described in Appendix A of Section 219.35 of the prior planning regulation. At a minimum, a written notice of appeal filed with the reviewing officer must:

1. State that the document is a notice of appeal filed pursuant to 36 CFR 219.17(b)(3);
2. List the name, address, and telephone number of the appellant;
3. Identify the decision about which the requester objects;
4. Identify the document in which the decision is contained by title and subject, date of the decision, and name and title of the deciding officer;
5. Identify specifically that portion of the decision or decision document to which the requester objects;
6. State the reasons for objecting, including issues of fact, law, regulation, or policy, and, if applicable, specifically how the decision violates law, regulation, or policy; and
7. Identify the specific change(s) in the decision that the appellant seeks.

Consistent with these procedures, a written notice of appeal must be hand-delivered, postmarked by the Postal Service, faxed, or e-mailed to the Appeal Reviewing Officer within 45 calendar days beginning the day after the date of publication of the legal notice of this decision in *The Richfield Reaper* and *The Spectrum*, newspapers of record. Written notices of appeal must be sent to: Appeal Reviewing Officer, Intermountain Region USFS, 324 25th Street, Ogden, Utah 84401 (or fax to 801-625-5277). The office business hours for those submitting hand-delivered appeals are: 8:00 a.m. to 4:30 p.m., Monday through Friday, excluding holidays. Electronic appeals must be submitted in a format such as an email message, pdf, plain text (txt), rich text format (rtf), or Word (doc or docx) to: appeals-intermtn-regional-office@fs.fed.us. The notice of appeal must have an identifiable name attached, or verification of identity will be required. A scanned signature may serve as verification on electronic appeals.

CONTACT FOR FURTHER INFORMATION

For further information regarding this project contact Rob Hamilton, Minerals Program Manager, at 115 E. 900 N., Richfield, UT 84701 or phone 435-896-1022.

Allen Rowley
ALLEN ROWLEY
Forest Supervisor
Fishlake National Forest

8/20/13
Date

Angelita Bulletts
ANGELITA BULLETTS
Forest Supervisor
Dixie National Forest

8/20/2013
Date

Fishlake National Forest Oil and Gas Leasing Analysis
Final Environmental Impact Statement
Beaver, Garfield, Iron, Juab, Millard, Piute, Sanpete, Sevier, and Wayne Counties, Utah

Lead Agency:	USDA Forest Service
Cooperating Agencies:	USDI Bureau of Land Management State of Utah
Responsible Officials:	Allen Rowley, Forest Supervisor Fishlake National Forest 115 East 900 North Richfield, UT 84701
	Angelita Bulletts, Forest Supervisor Dixie National Forest 1789 N Wedgewood Ln Cedar City, UT 84721
For Information Contact:	Rob Hamilton, Minerals Program Manager 115 East 900 North Richfield, UT 84701 (435) 896-1022

Abstract: This Final EIS identifies Fishlake National Forest lands that could be made available for oil and gas leasing, in accordance with the Mineral Leasing Act, under various leasing alternatives; describes the affected environment; and discusses reasonably foreseeable impacts of oil and gas activities on the human environment resulting from each leasing alternative. Issues and concerns expressed by the public and government agencies during the public comment period for this EIS have been addressed by the analysis. This analysis will be used by the Forest Supervisor of the Fishlake and Dixie National Forests and the Utah State Director of the Bureau of Land Management as the basis for making oil and gas leasing decisions under their authority. Alternative C is the preferred alternative.

Project Website: http://www.fs.usda.gov/goto/fishlake/projects

EXECUTIVE SUMMARY

The following information is provided as a convenient synopsis for the public. However, this synopsis is not a substitute for review of the complete Environmental Impact Statement (EIS). If there are any inconsistencies between this summary and the EIS, the EIS should be considered the authoritative document.

The Forest Service's national policy on minerals states: "Exploration, development, and production of mineral and energy resources and reclamation of activities are part of the Forest Service ecosystem management responsibility. The Forest Service will administer its minerals program to provide commodities for current and future generations commensurate with the need to sustain the long-term health and biological diversity of ecosystems (USFS 2007)."

In many parts of the United States, National Forest System (NFS) lands overlie geological formations that may contain oil and/or natural gas. The Forest Service's national policy on minerals (USFS 2007a) states that the "Exploration, development, and production of mineral and energy resources and reclamation of activities are part of the Forest Service's ecosystem management responsibility." The Forest Service allows leases on many NFS lands for the purpose of drilling wells and extracting oil and/or gas (USFS 2007a).

The Department of Interior, Bureau of Land Management (BLM), acts as the onshore leasing agent for the Federal Government. Forest Service and BLM regulations (36 CFR 228.102 and 43 CFR 3100, respectively) developed in response to the Federal Onshore Oil and Gas Leasing Reform Act of 1987 (FOOGLRA) require a leasing analysis be completed prior to offering leases on National Forest System lands (the federal leasing process is described in further detail in Section 1.8.5.1). The leasing analysis allows the Forest Service to decide whether or not federal lands under its administration will be administratively available for leasing, and under what conditions (leasing options) the leases will be issued. The National Environmental Policy Act (NEPA) of 1969 also requires the Forest Service, along with its cooperating agencies, to identify and assess potentially significant environmental impacts and address issues associated with oil and gas leasing.

Proposed Action and Decision

The Fishlake National Forest (FNF), with the cooperation of the BLM, is conducting this environmental analysis to identify which lands administered by the FNF with federal oil and gas rights to make administratively available for oil and gas leasing. The Forest Supervisor of the FNF will decide which areas would be administratively available for leasing, subject to the terms and conditions of the standard oil and gas lease form 3100-11 (BLM 2006a), or subject to constraints that would require the use of lease stipulations such as those prohibiting surface occupancy. The Fishlake and Dixie Forest Supervisors will also decide whether to approve non-significant Forest Plan amendments to update direction for oil and gas leasing, and surface protection. Where the Forest Service has consented to leasing with required stipulations, and the Secretary of Interior decides to issue a lease, the authorized officer (BLM State Director) shall incorporate the stipulations into any lease which it may issue (43 CFR 3101.7-2(a)). The responsible officials of the Forest Service and BLM will release separate Records of Decision (ROD). The RODs will not authorize specific, surface-disturbing activities. The RODs will only make a decision about which lands would be available for oil and gas leasing and what conditions and stipulations would apply to any oil and gas leases offered in the future. Environmental impacts of future oil and gas exploration and development activities would undergo future, project-specific environmental analyses.

The proposed action is to make all lands administered by the FNF available for lease. The following areas would be leased with the No Surface Occupancy (NSO) stipulation:

All Research Natural Areas; Quitchupah Canyon Cultural Area; Paradise Valley Cultural Resource Site; Old Spanish Trail corridor; Areas with slopes greater than 35 percent; North Horn sediment areas greater than 25 percent slope; Areas with geologic hazards or unstable soils; Areas within one mile of known federal threatened, endangered, or proposed (TEP) plants; Areas within one mile of Sensitive plant locations covered under a conservation agreement; Areas within 300 feet of riparian areas, wetlands, lakes, reservoirs, perennial streams, and springs; Drinking water source protection zones (Zones 1-3 and T2 and T4); Bald eagle winter concentration areas; Mexican spotted owl PACs; Goshawk core nesting areas; Within 4 miles of sage grouse leks; Known colonies of pygmy rabbits; Key habitats for boreal toad; Within ¼ mile of developed recreation sites and National Recreation Trails; Within ¼ mile of Forest Service administrative sites and facilities; Frequently viewed areas of High Scenic Integrity and Inventoried Roadless Areas.

The following areas would be leased with a Timing Limitation (TL) stipulation:

Sage grouse brood-rearing areas (May 1 to July 5); Sage grouse winter habitat (December 1 to March 15); Crucial elk and mule deer winter range (December 1 to April 15); Bighorn sheep lambing, crucial elk calving and mule deer fawning areas (May 1 to July 5); and Bighorn sheep winter range (Nov 1 to April 15).

The following areas would be leased with the Controlled Surface Use (CSU) stipulation:

Goshawk post-fledging areas; Active raptor nest areas as determined by the USFWS; and Class I airsheds.

Lease notices (LN) would be included in leases to inform prospective bidders of restrictions required by current laws or regulations. Such lease notices would include:

Required protection of Threatened, Endangered, and Proposed species under the Endangered Species Act including Mexican Spotted Owl, California Condor, Western Yellow-billed Cuckoo, and Utah Prairie Dog; Required protection of Migratory Birds; Required protection of Sensitive and Management Indicator Species (Plants and Wildlife); Required protection of cultural and paleontological resources under the National Historic Preservation Act and other related laws; and Required protection of air resources; and Compliance with State of Utah surface, ground and transient water source protection and other water resource requirements.

Other Lease Notices would be included in new leases if new non-discretionary laws or regulations were passed with restrictions that would likely affect oil and gas operations.

All other areas would be leased with standard lease terms and conditions.

Purpose and Need

The current FNF Land and Resource Management Plan (LRMP) was completed prior to the passage of the FOOGLRA, and does not determine the availability of NFS lands for oil and gas leasing. The purpose of this leasing analysis is to identify which lands would be available and approved for oil and gas leasing, to determine what standard or special lease stipulations would apply to which pieces of land for resource protection, to project the type and amount of post-leasing activity that would be reasonably foreseeable, and to analyze the potential impacts of reasonably foreseeable post-leasing activity.

Lands Involved in the Decision

The analysis area (Figure 1.5-1) includes all NFS lands on the four FNF Ranger Districts. The analysis area is approximately 1,707,810 acres. This EIS considers only NFS lands with federal oil and gas rights legally open to oil and gas leasing. There are no lands within this analysis area that are closed to oil and gas leasing by statute, act of Congress, executive order, or by order of the Secretary of the Interior.

The analysis area encompasses one existing oil and gas lease of approximately 302 acres. New leasing decisions made as a result of this analysis would not affect the existing lease; however, leased lands are included in the analysis so that when the lease expires, the decision has been made whether or not to offer them for lease again and under what conditions. It is possible that currently leased lands would not be available for lease in the future or that they would be available with stipulations that are not in the current lease.

Issues and Alternative Development

Public and Agency Scoping

The Notice of Intent (NOI) for this EIS was published on July 7, 2006 in the Federal Register, Volume 71, No. 130, pages 38602 – 38604. The publication of the NOI initiated the formal 45-day scoping period. The project has been listed in the quarterly Schedule of Proposed Actions (SOPA) since April 1, 2006.

A public breakout session regarding the oil and gas leasing analysis and preparation of this EIS was conducted during the Dixie and Fishlake Forest Plan Forum on June 28, 2006. A legal notice was published in the Richfield Reaper on July 5, 2006.

News releases with project scoping information were published in several supplemental publications in June 2006, including the Garfield County Insider, Millard County Chronicle Progress, Richfield Reaper, and Wayne County Insider. Letters were sent to 250 individuals and organizations, and six public meetings were conducted in Beaver, Fillmore, Junction, Loa, Richfield, and Salina, Utah. Finally, due to the time lapse between initial scoping and release of a DEIS, a Corrected NOI was published January 18, 2011 in the Federal Register, Volume 76, No. 11, pages 2881 – 2882.

Key Issues

Through public scoping, nine key resource issues were identified and alternatives were developed to address these issues. Measurement indicators were also developed to quantify the environmental impacts to each identified resource. The key resource issues include:

Issue #1: Wildlife Resources

Activities associated with post-leasing oil and gas exploration and development could cause detrimental impacts to wildlife, including threatened, endangered, proposed, sensitive, migratory birds, and FNF management indicator species (MIS). These impacts could include decreased security due to increased access, displacement, disruption of breeding and rearing of young, death of individuals, direct habitat loss, decrease to population trends, habitat fragmentation, and conflict with existing conservation agreements.

Issue #2: Unroaded/Undeveloped Areas

Activities associated with post-leasing oil and gas exploration and development could change the wilderness quality of unroaded/undeveloped areas which are outside of but contiguous to an Inventoried Roadless Area (IRA).

Issue #3: Visual and Scenic Integrity

Activities associated with post-leasing oil and gas exploration and development could degrade the scenic integrity of the Forest and cause a decrease in visitation and forest use.

Issue #4: Geologic Hazards and Steep Slopes

Ground-disturbing activities associated with oil and gas exploration and the subsequent development of roads, pipelines and production fields may cause a decrease in slope stability within large areas of steep to very steep terrain. This could result in accelerated rates of soil erosion with rapid runoff events followed by sedimentation of local water bodies.

Issue #5: Water Quality

Activities associated with post-leasing oil and gas exploration and development could cause contamination to ground water and surface water.

Issue #6: Fisheries

Activities associated with post-leasing oil and gas exploration and development could cause an increase in sedimentation and otherwise degrade coldwater aquatic habitat and watershed conditions, resulting in declining recruitment of trout, and reduce the sustainability of native trout populations.

Issue #7: Vegetation

Activities associated with post-leasing oil and gas exploration and development could cause loss of individual endangered, threatened, sensitive and/or MIS plants or plant populations. Noxious weed populations could increase as a result of ground disturbance associated with oil and gas exploration and development.

Issue #8: Air Quality

Activities associated with post-leasing oil and gas exploration and development could result in emitting atmospheric pollutants including fine particulates, NOx and volatile organic compounds, degrading air quality. Air quality degradation would be especially sensitive in Class I airsheds, such as Capitol Reef and Bryce Canyon National Parks.

Issue #9: Social/Economic

Lack of opportunities to lease federal land for oil and gas exploration and development could cause a shortage of domestic oil and gas supplies, and result in high prices for gas and oil. A shortage of domestic oil and gas supply results in dependence on foreign energy supplies.

Leasing Options

Alternatives were developed by assigning various leasing options to provide varying degrees of protection to the resources identified as key issues. The leasing options used in development of the alternatives include stipulations listed in the Uniform Format for Oil and Gas Lease Stipulations published by the Rocky Mountain Regional Coordinating Committee in March 1989 (RMRCC 1989). Leasing options used include:

NO LEASE (NL): Federal minerals within the analysis area would not be administratively available for leasing. Existing leases would remain in effect until they terminate or expire.

NO SURFACE OCCUPANCY (NSO): Use or occupancy of the land surface for fluid mineral exploration or development is prohibited. With the exception of seismic exploration, NSO applies to all uses and facilities associated with oil and gas development.

TIMING LIMITATIONS (TL): The TL stipulation (often called seasonal restrictions) prohibits surface use during specified time periods. A TL applies for restrictions longer than 60 days and shorter than one year.

CONTROLLED SURFACE USE (CSU): The CSU stipulation is intended to be used when fluid mineral occupancy and use are generally allowed on all or portions of the lease area year-round, but because of special values, or resource concerns, lease activities must be strictly controlled. The CSU stipulation is used to identify constraints on surface use or operations that may otherwise exceed the mitigation provided by Section 6 of the standard lease terms and the regulations and operating orders.

LEASE NOTICE (LN): A LN is not a stipulation, rather a notice attached to leases to transmit information at the time of lease issuance to assist the lessee in submitting acceptable plans of operation, or to assist in administration of leases. A LN is attached to leases in the same manner as stipulations; however, a LN does not involve new restrictions or requirements. Any requirements contained in a LN must be fully supported in a law, regulation, Standard Lease Term (SLT&C), or onshore oil and gas order.

STANDARD LEASE TERMS AND CONDITIONS (SLT&C): Under the SLT&C, the lessee has the right to use as much of the leased lands as is necessary to explore or drill for, extract, remove, and dispose of oil and gas deposits that may be in the leased lands, together with the right to build and maintain necessary improvements thereon. SLT&C requires the operator to conduct operations in a manner that minimizes adverse impacts to the land, air, water, cultural, biological, visual, and other resources and land uses or users. Operations cannot violate any other federal environmental protection laws (e.g., Clean Air Act, Clean Water Act, Endangered Species Act, etc.). Measures to avoid impacts to specified resources include, but are not limited to, the modification to the siting or design of facilities, timing of operations, and specification of interim and final reclamation measures. Well sites may be moved up to 200 meters (656 feet) and operations delayed for up to 60 days without interfering with the lease rights.

Alternatives Considered in Detail

Four alternatives were developed and were assigned a letter (A – D). Alternative A is the no action/no lease alternative and would not authorize new oil and gas leasing on the FNF. Alternatives B – D all allow new oil and gas leasing. The differences between Alternative B – D are in the lease stipulations applied that would restrict where and under what conditions oil and gas leasing could occur. In general, Alternative B applies the least restrictive leasing options and Alternate D the most restrictive. Alternatives C falls between B and D in terms of the leasing options applied. All action alternatives, B – D would require a Forest Plan amendment to include the leasing decision and stipulations in direction for minerals management.

Alternative A: Section 1502.14(d) of the NEPA regulations requires the analysis of a No Action Alternative. Under Alternative A, present management activities as pertaining to oil and gas leasing would continue unchanged. The Forest Supervisor can also select a Forest-wide No Lease Alternative that would not allow leasing anywhere on the Forest. This would be different from not taking any action, as in the No Action Alternative, since a decision would be made that would prohibit leasing. Both options would result in no new oil and gas leasing and have been combined for analysis purposes. The Forest Supervisor under this alternative would not make any new leasing decisions and no new oil and gas leasing would be allowed on the FNF. The one existing lease would not be affected. However, when the lease expires no new lease would be authorized in this area.

Alternative B: Under this alternative, all lands legally open to oil and gas leasing would be determined to be administratively available for leasing with standard lease terms and conditions (BLM Lease Form 3100-11), and existing laws and their implementing regulations, and reasonable operating standards or mitigation measures required by the permitting agencies. Laws that require specific protection of resources for all activities which could affect operations regardless of lease stipulations include, but are not limited to, the Endangered Species Act, Migratory Bird Treaty Act, National Historic Preservation Act, Clean Water Act, and Clean Air Act.

Alternative C: Alternative C is the Proposed Action as previously described.

Alternative D: This alternative was developed in response to two comment letters received from Utah Environmental Congress (UEC) and organizations they partner with, during the two scoping periods in 2006 and 2011. Alternative D was developed specifically to include the components and elements requested by UEC, and the organizations they partner with (comment letters are available for review in the administrative record). The UEC refers to this as the “SMU” Alternative. This alternative would emphasize the protection of non-mineral resources and uses over oil and gas exploration and development activities and the associated economic benefits. Comments submitted by environmental groups, sportsmen, and other groups and individuals who expressed that natural resource protection should be emphasized over oil and gas activities, are also addressed by this alternative.

Affected Environment

The scenic beauty of the FNF is one of its major attractions. Scenic resources are a composite of basic terrain, geologic features, water features, vegetative patterns, and land use effects that typify an area and influence the visual appeal that area may have to people.

The FNF covers parts of Beaver, Garfield, Iron, Juab, Millard, Piute, Sanpete, Sevier, and Wayne counties in central Utah. Rural communities, farms, ranches, and residences which could be affected are generally located in the valleys between the individual mountainous units of the Forest. The FNF consists mainly of north-south trending mountains and plateaus bounded by adjacent valleys and basins.

Air quality on the Fishlake N.F. is considered good to excellent and is currently meeting all National Ambient Air Quality Standards. Climatic conditions and an absence of major air pollution sources contribute to this condition. Visibility (regional haze) is good to excellent and improving. Greenhouse gasses are mostly anthropogenic with carbon dioxide comprising the largest percentage of the gasses. There are five Class I areas and eleven sensitive Class II areas that could be impacted by the Proposed Action located within 100 kilometers of the Forest.

The FNF ranges from 5,000 feet in elevation to 12,169 at Delano Peak and provides habitat for a broad diversity of endemic plant species. There are diverse vegetative communities ranging from sagebrush-steppe to alpine-krumholtz tundra. The 1,707,810 acres administered by the FNF is broken down into four management districts: Fillmore Ranger District, Fremont River Ranger District, Beaver Ranger District, and the Richfield Ranger District.

Previous cultural resource inventories conducted on the Forest have resulted in the identification and recordation of about 2,400 sites including prehistoric camps, wikiups, hearths, rock shelters, lithic and ceramic scatters, rock art, historic cabins, corrals, fences, battle sites, mines and mills, and some paleontological locations. The data suggests that the identified sites known to occur on the Forest were occupied from thousands of years BCE, to just a few hundred years ago.

The FNF has a large diversity of habitats, ranging from low elevation shrub-steppe around 6,000 feet, extensive aspen habitats from the mid to upper elevations, and high alpine krumholtz on the Tushar Mountains over 12,000 feet. Because of this variety, there is a great diversity of fish and wildlife species on the FNF (over 300 species of wildlife). The habitat areas on the FNF are important for the conservation of federally listed species, regionally listed (USDA FS) sensitive species, and game and non-game species.

The variety of vegetation on the FNF is reflective of the Forests' soils, climatic patterns, disturbance histories, and elevations. The lower and drier slopes are dominated by pinion and juniper mixed with sagebrush and interspersed with an occasional meadow or riparian zone. On the Fishlake, Douglas-fir and white fir appear at mid elevations. Higher elevation areas are dominated by aspen mixed with Engelmann spruce and subalpine fir. Other vegetation types occur at different elevations and moisture regimes including mixed conifer and mountain shrubs. Mixed conifer eco-systems offer a variety of green textures and colors based on their species composition. Bristlecone pine is only known to exist on Thousand Lake Mountain.

The FNF supports a variety of terrestrial and aquatic wildlife species that contribute to ecosystem function in a wide array of habitats and settings. The many lakes, reservoirs, and streams support an active sport fishery. The FNF is known for the deep cold waters of Fish Lake. The plateaus and high elevation lakes of the Forest characterize the Forest's unique geologic features. Many of the rivers and creeks throughout the FNF provide habitat for endemic trout populations, including Bonneville and Colorado River cutthroat trout. These waterways also provide excellent, diverse sport-fishing opportunities. In addition to supporting wildlife biodiversity, these water resources provide culinary water to adjacent communities.

Aquatic ecosystems are defined as "environments characterized by the presence of standing or flowing water" (Forest Service Manual 2605). Within the FNF, aquatic ecosystems are associated with lakes, streams, springs, seeps, and ponds. Wetlands are those areas that are inundated or saturated by surface water or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. Riparian areas are defined as a vegetated ecosystem along a water body through which energy, materials, and water pass.

Riparian areas characteristically have a high water table and are subject to periodic flooding and influence from the adjacent water body. These systems encompass wetlands, uplands, or some combination of these two landforms. They will not in all cases have all the characteristics necessary for them to be also classified as wetlands. Multiple uses within these watersheds have been compatible with desired water quality.

Groundwater contributes to maintaining base flow for streams and springs and to maintaining riparian ecosystems. Humans derive benefit from groundwater uses, such as drinking water, irrigation, industry, and recreation.

Environmental Consequences

General effects to resource areas that were deemed key issues are summarized here. More detailed effects by alternative are contained in Chapter 3, Environmental Consequences.

The authorization of a lease does not cause environmental impacts; however, authorizing a lease grants the lessee the right to conduct oil and gas exploration and development activities in the future. The environmental consequences of oil and gas activities are analyzed in this EIS as connected actions to oil and gas leasing. Oil and gas activities that are expected to occur on leases include seismic exploration, exploratory drilling, and development and production. During seismic exploration, some surface disturbance would occur from overland travel by buggies, and seismic blasts would cause temporary noise disturbances.

The main impacts to fish and wildlife that are possible from land clearing include mortality, injury, and habitat modification, fragmentation, and loss. For wildlife, the destruction of occupied burrows or nests, displacement, and the direct disturbance of habitat during land clearing would result in direct impacts. The loss of forested habitats, as well as sagebrush, would generally be long term, while the loss of grassland or forbs could be short term if areas re-vegetate with native species.

Wildlife

The main impacts to fish and wildlife that are possible from land clearing include mortality, injury, and habitat modification, habitat fragmentation, and loss. For wildlife, the destruction of occupied burrows or nests, displacement, and the direct disturbance of habitat during land clearing would result in direct impacts. The loss of forested habitats, as well as, sagebrush, would generally be long-term, while the loss of grassland or forbs could be short-term if areas re-vegetate with native species. For fish, land clearing in the vicinity of an occupied stream can increase the potential for delivery of organic molecules, sediments, nutrients, salts, and heavy metals (Trombulak and Frissel 2000) or surface water runoff because vegetation is no longer present to block or dilute such introductions. Roads are often located closer to streams than well pads and are more likely to cause erosion or provide a channel for delivery of hazardous substances. These occurrences can degrade habitat and ecosystem functioning, which may affect fish habitat (e.g., water temperature, stream bank vegetation, large woody debris). The Fishlake National Forest has developed Oil and Gas Operating Standards (Appendix F) which are designed to avoid these impacts.

For most wildlife species, the area of affected wildlife habitat would be far larger than the area directly occupied by oil and gas activities. Indirect effects such as avoidance and stress responses by wildlife to increased human activity extend the influence of each well pad, road, and facility. The extent of human influence varies by habitat type and species, but may extend up to two miles or more for species such as mule deer (Sawyer et al. 2006). In some cases the result is partial, or even total, loss of habitat effectiveness for the species within the area of influence. Loss of habitat due to human disturbance (displacement) may cause individuals to experience lower reproductive success, decreased body condition or mortality. The increase in density of individuals in the remaining area may lead to greater competition for limited resources and further stress. Displacement is more likely to have negative impacts when it occurs in key habitat types or during sensitive periods such as breeding or rearing of young. Small, isolated disturbances within non-limiting habitats may be of minor consequence within most ecosystems. However, larger-scale developments within key habitat may have significant impacts on wildlife populations because the undisturbed habitat surrounding the disturbance is less likely to be as suitable (WFGD 2004).

Fragmentation of wildlife habitats is a concern with oil and gas activities due to the linear extent of many activities, including seismic exploration and roads connecting well pads. For larger mammals, fragmentation may hinder migration and dispersal. Smaller species such as small mammals and reptiles are affected by single roads that may split a population in half and prevent migration in and out. Road crossings in streams can create barriers to fish movement (Trombulak and Frissel 2000), which can isolate fish populations. Fragmentation of fish and wildlife populations leads to reduced genetic diversity and increased susceptibility to population decline. Under certain circumstances fragmentation may enhance habitat effectiveness by creating barriers to disease transmission or blocking the spread of invasive or exotic species (i.e. fish barriers and Bonneville cutthroat trout recovery), but these cases tend to be the exception and habitat fragmentation is usually detrimental to wildlife populations.

Impacts to wildlife and fisheries resources from the different phases of oil and gas development depend on the duration, amount, and type of disturbance involved. The following phases as described in the RFDS are discussed in terms of possible impacts to all wildlife species: seismic activity, exploratory drilling and road construction, and production.

Seismic Activity - Seismic exploration involving both buggies and helicopters would temporarily disturb wildlife, due to noise and human presence, in the vicinity of operations. Noise would be produced mainly by the explosives used to generate vibrations. Mobile wildlife will probably move away from the disturbance and return to the area once the activity is completed. Seismic activities would have a negligible impact on fisheries because surface disturbance is minimal and vibrations would be temporary. In terms of habitat impacts, seismic activities would involve temporary impacts because vegetation crushed by overland travel would soon recover; likely the following year for herbaceous vegetation. Shrubs and small trees would take longer to recover, and such vegetation crushed during seismic activity may not be suitable as cover or nesting structure in the short-term (up to 10 years).

Exploratory Drilling and Road Construction - Exploratory drilling involves the construction of dill pads and access roads, which alters wildlife habitat (land clearing), impacts stream channels, and increases the potential for the introduction of sediment and hazardous materials to the aquatic system. Disturbance to wildlife caused by intermittent human presence on an exploration well would be short-term, lasting for the duration of operations. Direct mortality may occur to smaller species, such as rodents, reptiles, and (nesting) birds, during construction of the pad and roads. Noise disturbances from the actual drilling would be temporary. Human presence and noise could cause mobile individuals in the vicinity to be displaced; individuals may or may not return to the area after reclamation. Fish could be affected by streams crossings (culverts), and by the potential for habitat degradation, caused by increases in sediment yield, short-term pulses of turbidity, and chemical contamination that are the result of construction and use of developments near streams.

Production - A production field would involve the largest amount of disturbance and the most adverse impacts to wildlife. After production wells are constructed, human presence and noise may continue at a moderate level for the first year; in subsequent years these disturbances would drop to about one person per day. Because of direct habitat loss to roads and structures and indirect loss due to displacement the area surrounding each production well could potentially be unsuitable for many wildlife species for the life of the project. Direct mortality could occur during construction to any small, less mobile species within disturbance footprints. Fishes could be impacted during this time by noise and any additional road building in proximity to or across occupied streams.

Undeveloped/Unroaded Areas

Possible effects to Undeveloped/Unroaded areas are the loss of acres to development of oil and gas activities, along with associated roads, further dissecting and segregating areas into smaller parcels. Undeveloped Area Evaluation (UAE) parcels may not be suitable for wilderness potential by becoming smaller than 5000 acres. However, smaller parcels may be linked to IRA and still have value for potential wilderness areas. It is not possible to calculate how and where this may occur as the Reasonably Foreseeable Development Scenario (RFDS) is not site-specific. NEPA analysis at the time of the Application to Permit Drilling on a leased parcel will be necessary to determine actual effects to a given Undeveloped and Unroaded Area in the Draft UAE.

Visual and Scenic Integrity

In the short term, oil and gas leasing activity or exploration could immediately increase contrasts of form, line, color, or texture. Visual evidence of any new access roads, including existing roads that are reconstructed or improved could become particularly apparent. Due to the attributes of line, relative scale and color these contrasting linear elements often remain very noticeable or dominant until subsequent and successful re-establishment of vegetation.

Structures typically have adverse visual impact; particularly from unnatural silhouette effect when located at the skyline or set against a background of snow. Vertical structures are very apparent from great distances, particularly if in silhouette or relatively horizontal landscapes.

Views from major travel corridors or viewpoints of areas not having surface development would not be affected to any level of dominance in the long term, particularly given adequate mitigation. Generally, views involving structures, utilities, etc. possess sufficient variety in color, form and texture so as to preclude any long term dominant visual impact if sensitively designed. Direct or indirect benefit (shadow effect) resulting from the irregular or uneven topography of most areas would also assist in camouflaging lease related effects.

A majority of the scenically sensitive areas with potential for lease would not be seen while traveling in both directions on important routes or from the National Park or major communities. They are either not available for lease or are effectively screened by topography so as not to be readily apparent in linear view for an extended duration as seen by travelers.

Geologic Hazards and Steep Slopes

All five potential issues associated with geologic hazards and soil resources would be managed under SLT&C under Alternative B, and the conditions to produce oil and gas resources would be listed as terms on the USDI – BLM / Offer to Lease and Lease for Oil and Gas Form 3100 – 11.

While the USDI-Form 3100-11 mentions the need to protect various resources and discusses land use responsibilities, it is not specific enough to protect soils with displacement issues, puddling, and compaction, accelerated rates of erosion and ensure an adequate amount of new vegetation and protective ground cover to stabilize valuable topsoil deposits.

Under Alternative C, potential land issues associated with geologic hazards and very steep slopes were labeled NSO due to risky terrain. Specifically, the SLT&C of Alternative B were deemed insufficient to adequately protect the soil resource according to the public interest.

According to the Geologic Hazards and Soil Resources Map for Alternative C there are approximately 52,487 acres of fragile soils derived from unstable, clayey sediments of the North Horn Geologic Formation occurring on upland, mountain and high mountain landscapes located in areas measuring > 25 % slope, and about 492,327 acres of NFS lands located on very steep (>35%) terrain. These are steep sites which would be avoided.

Puddling, compaction and wetlands will be addressed with a LN as a form of guidance for the Lessee to consider when submitting a Plan of Operation. According to Alternative C, there are about 87,420 acres of clayey soils located on the Forest, sites which are susceptible to deformation in the form of puddling and compaction disturbances. To a lesser extent, there are about 5,029 acres of NFS lands that actually qualify for wetlands containing hydric soils. The Forest will make a full disclosure of these fragile locations to the Lessee under a LN.

Alternative D adds even more restrictive stipulations to the proposed leasing activities. In order to achieve maximum resource protection, wetlands are grouped together with geologic hazards and very steep slopes under the NSO stipulation. In addition, all soils derived from North Horn sediments are placed under NSO protection.

Water Quality

All action alternatives would have some potential or risk for adverse impacts on water quality. It is nearly impossible without specific exploratory and full field development plans to say how much the difference in magnitude of impacts would be between alternatives on hydrologic resources. Site specific analysis will need to occur later, but will likely disclose that there will be negligible effects from any of the action alternatives, and only minimal differences between the different action alternatives. Negligible effects are expected because of the multitude of environmental protection measures (BMPs) available to the Forest during exploratory and development phases. Minimal differences between alternatives are expected because the RFD scenario is the same all action alternatives.

Facility construction, maintenance, and use could increase the potential for surface erosion, which could contaminate surface water and adversely impact stream channels and aquatic habitats. Water from exploration and production facilities could become contaminated with chemical pollutants used at the facilities and flow from the disturbed areas to adjacent surface waters. Springs, streams, lakes and reservoirs, and wetlands are particularly vulnerable to pollution and increased sediment loads. Culinary water sources are of special concern.

Both the quantity of the eroded material and the percentage of the material that makes its way to a stream are wholly dependent upon very site-specific factors including: soil characteristics, ground slope, distance between the disturbance and the stream, buffers to the stream, and vegetation characteristics of the area between the disturbance and the stream, among others. Once sediment has reached a stream, the distance and timing of its downstream progression is highly dependent upon factors such as particle size, flow patterns, stream velocity, bed substrate, and channel morphology, among others.

Localized runoff that can cause adverse sediment-related water quality impacts is similarly site-specific. Construction activities in areas with steep slopes and less permeable soils often result in increased runoff from uplands.   On a local level, and/or where the impacted acreage represents a higher percentage of the watershed area, the increased runoff volumes could trigger gully development and/or accelerated stream bank erosion in receiving streams. It could also exacerbate instability in previously existing deteriorated or vulnerable streams. Both would have adverse water quality impacts due to sediments.

Minimal impact to groundwater systems may occur with the introduction of drilling fluids (filtrate) into the subsurface geologic horizons. This is normal and unavoidable during rotary drilling operations, and would only influence the immediate vicinity of the wellbore. The potential for communication, contamination, and commingling of formations via the wellbore would be possible if standard drilling procedures are not followed. The BLM requires that the proposed drilling program be designed to prevent this; therefore no impacts would be expected. Lining of the reserve pit would minimize potential impacts and effects to shallow groundwater (if any) in the vicinity of the proposed well. Any water produced with oil and/or gas would require disposal in accordance with the requirements of Onshore Oil and Gas Order No.7, Disposal of Produced Water, and appropriate State of Utah water disposal regulations.

Fisheries

Potential direct and indirect impacts to resident trout species from oil and gas activity on the FNF are likely to occur from increased sedimentation inputs into the water, toxic inputs to the streams or reservoirs, adverse impacts to habitat and aquatic environment due to impacts to riparian habitat, spread of aquatic nuisance species, and from dewatering.

Increased sediment inputs are likely to occur from newly constructed roads near waters, stream crossings and pads where sediment can be washed into waterways. Such sediment inputs decreases water quality, negatively impacts aquatic insect populations, that are critical food for resident trout, and silts over gravel spawning beds negatively impacting reproduction. The site-specific placement of these facilities in relation to streams and reservoirs, as well as mitigation/best management practices used will directly affect the amount of sediment entering the fisheries on the forest.

The activities associated with oil and gas development have a relatively low risk for spreading aquatic nuisance species, provided BMP's are followed for movement of water and proper cleaning of equipment used for pumping water. Following these measures would provide further protection against spreading these problematic species. If these protection measure recommendations are not followed and any of these aquatic nuisance species, such as whirling disease, zebra mussel, quagga mussel, etc., were spread on the forest, they could have moderate to major adverse impacts to resident trout within that drainage.

At the level of activity that will be authorized by this programmatic leasing EIS, the potential downstream impacts, which are predicted to be minor to negligible at the sub-watershed and forest scale, would be immeasurable against the background of variation due to downstream impacts, weather patterns, etc. This project would thus have no effect or no impact to downstream warm water Colorado River native fish species of concern.

Vegetation

Impacts to three of the Sensitive plant species that occur on the FNF are likely. The habitats for *Eriogonum batemanii var. ostlundii* (Elsinore buckwheat), *Penstemon wardii* (Ward beardtongue) and *Tonsendia jonesii var. lutea* (Sevier Townsendia) all fall within areas that have high potential for oil and gas development. The known populations of the remaining sensitive plant species as well as the Forest MIS plant species primarily fall within the low and moderate potential areas.

Alternative B "may impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species" for all of the Sensitive and MIS plant species known to occur on lands administered by the Fishlake National Forest.

In Alternative C the potential impacts to TES plant species would be minimal. The NSO areas developed for the threatened and endangered plants would prohibit any impacts to known locations. This action alternative would have "No Effect" on any population or individual federally listed plant species, and "no impact" on any individual or known habitat of the following Sensitive species: *Aster kingii var. barnebyana*, *Cymopterus beckii*, *Epilobium nevadense, Gilia caespitosa, Najas caespitosa, Salix arizonica, Senecio castoreus, Thelesperma subnudum var. alpinum*.

Alternative C "may impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species" for the following species: *Astragalus consobrinus, Astragalus henrimontanensis, Astragalus perianus, Botrychium paradoxum, Castilleja aquariensis, Castilleja parvula var. parvula, Draba sobolifera, Eriogonum batemanii var. ostlundii, Penstemon parvus, Penstemon wardii, Potentilla angelliae, Tonsendia jonesii var. lutea*.

Alternative D would have "No Effect" on any population or individual federally listed plant species. In addition this action alternative will have "no impact" on any individual or known habitat of the Sensitive and MIS plants known to occur on lands administered by the Fishlake National Forest.

Air Quality

Under any alternative, impacts to air resources would only result if oil field exploration and construction activities, oil field development, operating and maintenance activities, and sustainable production occur. The amount of dust generated by these activities would depend on the soil type, moisture conditions, dust control efforts, and the amount of traffic on dirt or gravel roads. Vehicle exhaust emissions would primarily depend on the amount of traffic. Impacts to air resources would be dependent on the distance from the potential activities to their receptors and their elevations. Effects of oil and gas exploration and development were predicted using the reasonably foreseeable development scenario and air quality modeling. Generally, results predicted that air quality standards would continue to be met if the receptor was in a Class I airshed and was at an elevation above or below and at a distance of 55 kilometers or greater away from a production well or 5 kilometers or greater away from an exploratory well. Further modeling and analysis is recommended if the source is less than 55 or 5 kilometers respectively. Results predicted no potential compliance problems if the receptor was in a Class II airshed. Similar results and recommendations are made related visibility standards. Oil and gas development is predicted to have little effect on greenhouse gasses regionally and negligible effects nationally and globally. Oil and gas development may also release criteria pollutants that can contribute to acid rain and its impacts on lakes and vegetation. Further discussions of impacts on air quality, visibility, greenhouse gasses and acid rain are covered in the Air Quality Section and Appendices D and E of this FEIS.

There is the potential for oil and gas exploration and development activities to encounter hydrogen sulfide gas in the subsurface. Hydrogen sulfide exhibits a range of toxic effects to human health depending on its concentration in the atmosphere. Releases of significant amounts of hydrogen sulfide are minimized through precautions normally taken by industry personnel, but serious accidents can potentially cause significant impacts to human health. Safety precautions are implemented when hydrogen sulfide is expected or known to be present protecting human health and welfare.

Social/Economic

Energy development can bring with it economic prosperity in the form of increased employment, higher incomes, and an increased tax base. Development can also cause adverse effects if local communities cannot accommodate population increases associated with the development. The influx of workers and their families could cause changes in social structures and life styles and impose economic hardships if the need for public facilities and services arises before adequate local revenue sources are generated within the region.

Under the various leasing options for development of the FNF oil and gas resources, a variety of changes in the human environment of the study area could occur. Direct effects would include changes in employment and income that result from new jobs in the community, increased revenue to local governments, and a possible increase in domestic oil and gas supply. Indirect changes could take the form of increased business for local merchants and professionals (which would also increase the demand for labor), and possibly increase the population if development activities induce people to relocate permanently to the area.

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1.0 PURPOSE OF AND NEED FOR ACTION

1.1 DOCUMENT STRUCTURE

The Forest Service has prepared this EIS in compliance with the NEPA and other relevant Federal and State laws and regulations. This EIS discloses the direct, indirect, and cumulative environmental impacts that could result from the proposed action and alternatives. The document is organized into four chapters:

Chapter 1 – Purpose and Need for Action: The chapter includes information on the history of the project proposal, the purpose of and need for the project, and the agency's proposal for achieving that purpose and need. This section also details how the Forest Service informed the public of the proposal and how the public responded.

Chapter 2 – Alternatives, including the Proposed Action: This chapter provides a more detailed description of the agency's proposed action as well as alternative methods for achieving the stated purpose. These alternatives were developed based on key issues raised by the public and other agencies. This discussion also includes mitigation measures. Finally, this section provides a summary table of the environmental consequences associated with each alternative.

Chapter 3 – Affected Environment and Environmental Consequences: This chapter describes the environmental effects of implementing the proposed action and other alternatives. This analysis is organized by key issues.

Chapter 4 – Consultation and Coordination: This chapter provides a list of preparers and agencies consulted during the development of the environmental impact statement.

Appendices – The appendices provide more detailed information to support the analyses presented in the environmental impact statement.

1.2 BACKGROUND

In many parts of the United States, NFS lands overlie geological formations that may contain oil and/or natural gas. The Forest Service national policy on minerals (USFS 2007a) states that the "Exploration, development, and production of mineral and energy resources and reclamation of activities are part of the Forest Service's ecosystem management responsibility." In addition, the policy (USFS 2007a) indicates that the need to provide commodities for current and future generations should be balanced with the need to sustain the long-term health and biological diversity of ecosystems. Further direction comes from the Mining and Mineral Policy Act of 1970, which states that the federal government is to "foster and encourage private enterprise in the development of economically sound and stable industries, and in the orderly and economic development of domestic resources to help assure satisfaction of industrial, security, and environmental needs." In accordance with these directives, the Forest Service works with the BLM to make many NFS lands available for leasing for the purpose of drilling exploratory wells and extracting oil and/or gas (USFS 2007a).

The BLM acts as the onshore leasing agent for the federal government. However, the FOOGLRA increased the role of the Forest Service in the oil and gas leasing process. Consequently, the Forest Service developed new regulations (36 CFR Part 228 Subpart E and Part 261) to be consistent with the FOOGLRA, and to provide guidance for oil and gas leasing and surface-use management on NFS lands. This established a staged decision process, which is designed to accommodate the speculative nature of oil and gas exploration and development. The first step in the process is a Forest Service leasing analysis. The Forest Service decides whether or not lands will be available for leasing, and under what conditions (leasing options) the leases will be issued.

The NEPA also requires the Forest Service, along with its cooperating agencies, to identify and assess potentially significant environmental impacts and address issues associated with oil and gas leasing. In accordance with the NEPA, the Forest Supervisor of the FNF has decided to prepare an EIS to document the Forest Service leasing analysis process, and disclose the potential effects of oil and gas leasing on the human environment. As the agency responsible for lease issuance and administration, the BLM has participated as a cooperating agency. The State of Utah also participated as a cooperating agency due to existing state jurisdiction by law and special expertise related to many resources including air quality, mining regulation, water quality, wildlife, and socioeconomics.

This EIS is not a decision document to grant the right to explore for and develop oil and gas. Rather, it is a document disclosing the environmental consequences of implementing various alternatives on the potential oil and gas leasing of lands that could be offered for lease in the future. Actual surface disturbing activities for oil and gas exploration and development would undergo future, project-specific environmental analyses.

1.3 PURPOSE AND NEED FOR ACTION

Agency regulations at 36 CFR 228.102 require the Forest Service to analyze lands under their jurisdiction that have not already been analyzed for oil and gas leasing. Minimal analysis of the effects of oil and gas leasing on landadministered by the FNF has previously been completed. The FOOGLRA established consent authority to the Forest Service for leasing, prior to the BLM offering NFS lands for lease. The BLM Utah State Office has received several Expressions of Interest (EOI) for leasing portions of the FNF. In order to facilitate the BLM processing and responding to those EOIs, the FNF must first complete a leasing analysis to determine which lands to consent to lease, and what stipulations will apply to those lands. Finally, the FNF LRMP has not been revised; therefore, an amendment is needed to update direction for protecting surface resources relative to minerals management, specifically oil and gas exploration and development.

The purpose of this leasing analysis is to identify which lands will be available and approved for oil and gas leasing, to determine what lease stipulations will apply to which pieces of land for resource protection, to project the type and amount of post-leasing activity that is reasonably foreseeable, and to analyze the potential impacts of reasonably foreseeable post-leasing activity.

1.4 PROPOSED ACTION

The proposed action is to make all lands administered by the FNF available for lease, with the following stipulations.

The following areas would be leased with the No Surface Occupancy (NSO) stipulation:

- All Research Natural Areas
- Inventoried Roadless Areas
- Quitchupah Canyon Cultural Area
- Paradise Valley Cultural Resource Site
- Old Spanish Trail corridor
- Areas with slopes greater than 35 percent
- North Horn sediment areas greater than 25 percent slope
- Areas with geologic hazards or unstable soils
- Habitat within one mile of known federal threatened, endangered, or proposed (TEP) plants
- Areas within one mile of Sensitive plant locations covered under a conservation agreement
- Areas within 300 feet of riparian areas, wetlands, lakes, reservoirs, perennial streams, and springs
- Drinking Water Source Protection Zones (Zones 1-3 and T2 and T4)
- Mexican spotted owl PACs
- Goshawk core nesting areas
- Bald eagle winter concentration areas
- Within four miles of sage grouse leks and nesting habitat
- Known colonies of pygmy rabbits
- Key habitats for boreal toad
- Within ¼ mile of developed recreation sites and National Recreation Trails
- Within ¼ mile of Forest Service administrative sites and facilities
- Frequently viewed areas of high scenic integrity

The following areas would be leased with a Timing Limitation (TL) stipulation:

- Sage grouse brood-rearing areas (May 1 to July 5)
- Sage grouse wintering habitat (December 1 to March 15)
- Bighorn sheep winter range (November 1 to April 15)
- Crucial elk and mule deer winter range (December 1 to April 15)
- Bighorn sheep lambing, crucial elk calving and mule deer fawning (May 1 to July 5)

The following areas would be leased with the Controlled Surface Use (CSU) stipulation:

- Goshawk post-fledging areas
- Active raptor nest areas as determined by the USFWS
- Class I airsheds

All other areas would be leased with standard lease terms and conditions. Lease notices would be included in leases to inform prospective bidders of restrictions required by law or regulation. See Appendix A for specific lease notices.

1.5 DECISION FRAMEWORK

The Forest Supervisor will decide which federal lands administered by the FNF with federal oil and gas ownership, will be administratively available for oil and gas leasing, and will identify required lease stipulations for specific areas (36 CFR 228.102(d)). The Forest Supervisor has the authority to authorize the BLM to offer available lands for lease, subject to the Forest Service identified stipulations (36 CFR 228.102(e)). This analysis will be used to amend the LRMPs of the FNF and Dixie National Forest, as necessary, to incorporate the leasing decisions and other changes as indicated in the analysis. The Teasdale portion of the Fremont River Ranger District was formerly managed by the Dixie N.F., with management direction included in the Dixie LRMP. This section of land is now managed by the FNF, and is included in this leasing analysis.

The BLM Deputy State Director for Minerals and Lands will decide whether to offer for lease those NFS lands authorized for leasing by the FS, and make the leasing decisions for non-federal lands with federal oil and gas ownership within the Forest boundaries (43 CFR 3100).

The responsible officials of the Forest Service and BLM will release separate RODs. The RODs will not authorize specific surface-disturbing activities. Post-lease proposals to conduct operations will be evaluated on a site-specific basis and the respective decisions will be documented in accordance with applicable laws and regulations.

1.6 COOPERATING AGENCIES

The BLM is responsible for issuing oil and gas leases on federal lands and on private or State lands for which the federal government retains mineral rights. The BLM cannot issue leases for lands administered by the Forest Service without consent from the Secretary of Agriculture. As the agency responsible for federal lease issuance and administration, the BLM participated in this EIS as a cooperating agency. The State of Utah is participating as a cooperating agency due to existing state jurisdiction by law and/or special expertise related to many resources including air quality, mining regulation, water quality, wildlife, and socioeconomics.

1.7 POLICY AND LEGISLATION

1.7.1 Land and Resource Management Plan

Management of each administrative unit of the NFS (one or more National Forest(s) or National Grassland(s)) is governed by a LRMP. The existing Fishlake LRMP was approved in 1986, and includes general decisions, as part of management prescriptions to provide for oil and gas leasing, but does not include decisions for leasing specific lands. Prior to the passage of the FOOGLRA, and except for acquired lands, the Forest Service had no authority to make decisions related to issuing or not issuing oil and gas leases on NFS lands. As a result, the current LRMP, which predates the FOOGLRA, does not fully meet the intent of the current regulations to make site-specific leasing decisions. This EIS and decisions the Forest Supervisor will make, including availability of lands for oil and gas leasing, will be used to develop an amendment to the LRMP.

1.7.2 Roadless Area Conservation Rule and Legal Activity

Litigation History and Status

The Roadless Area Conservation Rule (RACR) prohibits, with some exceptions, road construction and timber harvesting across 58.5 million acres of the National Forest System. The rule was published in the Federal Register on Jan. 12, 2001 (66 FR 3244). Ten lawsuits were filed challenging the rule. In May 2001, a preliminary injunction barring implementation of the rule was issued by a federal district court in Idaho. The Ninth Circuit Court of Appeals reversed that ruling, and the RACR became effective in April 2003. In June 2003, the State of Alaska settled its claims regarding the RACR and after further rulemaking the Tongass National Forest was exempted from the RACR (68 FR 75136). Two cases in North Dakota that involved the RACR were eventually settled in March 2007 and three others were dismissed.

However, in July 2003, a federal district court in Wyoming upheld the State of Wyoming's challenge to the RACR holding that promulgation of the RACR was procedurally flawed under NEPA and substantively illegal under the Wilderness Act. The court set aside and permanently enjoined the rule. The decision was appealed to the Tenth Circuit Court of Appeals, but the court declared the case moot and vacated the Wyoming order after the 2005 State Petitions Rule was promulgated.

The 2005 State Petitions Rule triggered two lawsuits in a district court of California. One lawsuit was filed by the States of California, New Mexico, and Oregon; and the other was filed by a coalition of environmental groups. On Sept. 20, 2006, the California court set aside the 2005 State Petitions Rule, and reinstated the RACR (including the Tongass amendment). The decision was appealed. On Aug. 5, 2009, the appellate court affirmed the district court's ruling.

In response to the reinstatement of the RACR, the State of Wyoming filed a second lawsuit (Wyoming II) challenging the RACR. On August 12, 2008, the Wyoming court again set aside and enjoined the RACR. The government filed an appeal on August 13, 2009 to the Tenth Circuit Court. Briefs were filed and oral hearing was held on March 10, 2010.

The Wyoming decision placed the Forest Service in a conundrum of trying to comply with the California court's order to follow the RACR and the Wyoming court's order to not follow the RACR. The Department of Justice submitted motions on August 20, 2008 to both courts requesting a stay or limiting the scope of both injunctions. On December 2, 2008, the California court changed its injunction to affect only the Ninth Circuit and the plaintiff State of New Mexico. On June 16, 2009, the Wyoming court denied the government's motion for reconsideration and suspension of its injunction.

On December 22, 2009, a coalition of Alaska Natives, recreation groups and environmentalists filed a lawsuit seeking to set aside the Tongass exemption of 2003 and all projects not fully consistent with the RACR.

On October 21, 2011, the United States Court of Appeals for the Tenth Circuit decided Wyoming v. USDA and found the Forest Service's adoption of the RACR does not violate federal law. The Tenth Circuit ordered the District of Wyoming Court to vacate its earlier ruling and lift its nationwide injunction of the RACR. The Tenth Circuit's decision is a positive step for the Forest

Service in its 10-year history of litigation involving the Roadless Rule.

In March 2012 Wyoming District Court lifted the Nationwide Injunction of the 2001 Roadless Area Conservation Rule in Wyoming v. U.S. Department of Agriculture. On March 1, 2012, in accordance with the recent Tenth Circuit opinion reversing the District Court's issuance of a permanent national injunction on the RACR and remanding the case back to the District Court with instructions to vacate the injunction, the District Court on March 1 issued an Order vacating the national injunction on the RACR. (07-00017, D. WY).

State Petitions Status

The States of California, Idaho, New Mexico, North Carolina, South Carolina, and Virginia filed petitions under the State Petitions Rule. Other States announcing they intended to file a petition under the State Petitions Rule included Arizona, Colorado, Illinois, Oregon, Washington, and Wisconsin.

After the California district court ruling, Idaho Governor James Risch re-submitted Idaho's petition under the Administrative Procedure Act (APA) for the management of 9.3 million inventoried roadless acres within that state. A final Idaho Roadless Rule was published in October 2008 (73 FR 61456). The final Idaho Roadless Rule supersedes the RACR in Idaho. Several environmental groups filed a lawsuit challenging the Idaho rule on January 16, 2009 claiming violations of the Endangered Species Act, and the National Environmental Policy Act. On January 9, 2011 the District Court issued a memorandum decision that the Endangered Species Act and the National Environmental Policy Act were not violated.

In November 2006, then Colorado Governor Bill Owen submitted a petition for the management of 4 million roadless acres of IRAs within that state. Governor Bill Ritter amended the petition in April 2007 and submitted it under the APA. With the State as a cooperating agency, a proposed rule was published on July 25, 2008 (73 FR 43544) and notice of availability of the supporting DEIS on August 1. On August 3, 2009, the State released a revised version of the rule with a 60-day comment period. Gov. Ritter submitted a revised petition to the Sec. of Agriculture on April 6, 2010. A final Colorado Roadless Rule was published in July 2012 (77 FR 39576).

Action by the Secretary of Agriculture

On May 28, 2009, Secretary of Agriculture Tom Vilsack issued Memorandum 1042-154 which reserves "to the Secretary the authority to approve or disapprove road construction or reconstruction and the cutting, sale, or removal of timber in those areas identified in the set of inventoried roadless area maps contained in Forest Service Roadless Area Conservation, Final Environmental Impact Statement, Volume 2, dated November 2000." The Memorandum did not affect lands covered by the Idaho rule (9.3 million acres), but includes the Tongass National Forest (9.3 million acres) in Alaska. Approximately, 49.2 million acres are affected. The Secretary has since re-delegated some authorities back to the Forest Service. Memorandum 1042-154 expired in one year.

On May 29, 2010, the Secretary issued a new Memorandum 1042-155. It is essentially the same as the previous memorandum with the re-delegations, but includes the re-delegation to the

Under Secretary Natural Resources and Environment for decisions covered by the 1872 Mining Laws. Memorandum 1042-155 expired in one year.

On May 30, 2011 the Secretary issued a third Memorandum 1042-156, again reserving to the Secretary the decision making authority over the construction and reconstruction of roads and the cutting, sale, or removal of timber in inventoried roadless areas, and re-delegating to the Under Secretary decisions associated with operations of locatable mining activities, and re-delegating to the Chief of the Forest Service certain approval decisions relating to emergency situations, and a few other situations. Memorandum 1042-156 expired on May 30, 2012.

On March 2, 2012, Judge Brimmer (Wyoming) lifted his injunction on the 2001 Roadless Area Conservation Rule. Lifting of the injunction paves the way for implementation of the RACR nationwide and provides much needed consistency regarding the management of Inventoried Roadless Areas.

Action by the Chief of the Forest Service – In a letter dated 5/31/2012, the Chief of the FS said that he is "continuing to review certain activities planned in roadless areas… to ensure a consistent approach to implementation of the 2001 Roadless Rule and that we are doing all we can to protect roadless area characteristics." An attachment to the letter outlined the types or projects requiring that review. Refer to "Chief's Review Process for Activities in Roadless Areas" in the project record.

Pending Legislation

Since 2001 four House and four Senate bills to legislate the RACR have been submitted but none were enacted. On October 1, 2009 Representative Jay Inslee (WA) and 154 cosponsors introduced HR 3692 and Senator Maria Cantwell (WA) and 24 cosponsors introduced S 1738 for the protection of roadless areas based on the 2001 rule. A related bill reintroduced on February 11, 2009, by Representative Carolyn Maloney and 95 cosponsors is the Northern Rockies Ecosystem Protection Act to designate certain National Forest System lands and public lands under the jurisdiction of the Secretary of the Interior in the States of Idaho, Montana, Oregon, Washington, and Wyoming as wilderness, wild and scenic rivers, wildland recovery areas, and biological connecting corridors, and for other purposes. Copies of these bills can be found at http://thomas.loc.gov/.

Additional information

The Forest Service maintains a roadless website at http://roadless.fs.fed.us/. Copies of the Secretary's Memorandum, RACR and state-specific rules, supporting documents, and other information are available.

1.7.3 Wild and Scenic River Suitability Study for National Forest System Lands in Utah

In November 2008, the Forest Service issued a ROD for the Wild and Scenic River Suitability Study for National Forest System Lands in Utah. Out of 86 eligible river segments on National Forests in Utah that were found eligible for consideration for Wild and Scenic Rivers designation during forest planning efforts, ten rivers were found suitable for designation. On the FNF, a 15 mile section of Fish Creek is suitable and recommended for inclusion into the National Wild and Scenic River System.

1.7.4 The Mineral Leasing Act of 1920 (as amended)

The Mineral Leasing Act of 1920, as amended, authorizes and governs oil and gas leasing on lands with federal oil and gas rights. The primary authority and responsibility for determinations regarding leasing remained with the Secretary of the Interior and the BLM. The Act makes deposits of oil and gas on federal lands available for oil and gas leasing, unless a specific land order has been issued to close an area. The Act also mandates that oil and gas surface disturbing activities be regulated and reclamation procedures developed for the conservation of surface resources. Further, with the exception of National Park System lands and Indian Trust lands, it authorizes rights-of-ways through federal lands for oil and gas pipelines. The development of regulations and stipulations for the protection of the environment, and individuals relying on the environment for subsistence purposes, are required for all rights-of way.

1.7.5 The Mineral Leasing Act for Acquired Lands of 1947

The Mineral Leasing Act for Acquired Lands of 1947 states that all deposits of coal, phosphate, oil, oil shale, gas, sodium, potassium, and sulfur that are owned or may be acquired by the US and that are within lands acquired by the US may be leased by the Secretary of the Interior under the same conditions as contained in the leasing provisions of the mineral leasing laws. No mineral deposits shall be leased without the consent of the head of the executive department having jurisdiction over the lands containing the deposit and subject to such conditions as that official may prescribe.

1.7.6 Multiple Mineral Development Act of 1954

The Multiple Mineral Development Act of 1954 was enacted to amend the mineral leasing laws and the mining laws to provide for multiple mineral developments of the same tracts of public lands. Prior to passage of the act, locatable minerals could not be patented on tracts of ground with existing mineral leases, and mineral leases could not be offered on lands with mineral patents. The Multiple Mineral Development Act was included as Chapter 12 in the Mining and Minerals Policy Act of 1970 (30 U.S.C 521 et seq.)

1.7.7 The Mining and Minerals Policy Act of 1970

The Mining and Minerals Policy Act of 1970 indicates that the continuing policy of the federal government is to foster and encourage private enterprise in the development of economically sound and stable domestic mining and minerals industries and the orderly and economic development of domestic mineral resources.

1.7.8 The Energy Security Act of 1980

The Energy Security Act of 1980 directs the Secretary of Agriculture to process applications for leases and permits to explore, drill, and develop resources on National Forest System lands, notwithstanding the current status of any management plan being prepared.

1.7.9 The Federal Onshore Oil and Gas Leasing Reform Act

The FOOGLRA amended the Mineral Leasing Act of 1920. It provided the Forest Service with more input on oil and gas leasing on NFS lands. Under the FOOGLRA, the authority to issue all leases for federally owned oil and gas remained with the BLM. However, Forest Service decisions for leasing with certain stipulations are binding on the BLM for NFS lands, if the BLM decision is to offer the leases for sale. Prior to the Leasing Reform Act of 1987, the Forest Service's authority regarding oil and gas leases issued on NFS lands was varied, and in most cases the Forest Service only made nonbinding recommendations to the BLM. The 36 CFR 228 subpart E regulations, issued in April 1990 established the process for making oil and gas leasing decisions in accordance with the FOOGLRA.

1.7.10 36 CFR 228E Regulations

Title 36 CFR, Subpart E, provides direction to the Forest Service to administer and regulate surface uses and leases on NFS lands. These regulations prescribe methods by which the Forest Service will make decisions with regard to oil and gas leases and subsequent management of oil and gas operations. These regulations lay out the process for determining lands administratively available for leasing, including the designation of stipulations and the projection and analysis of post-leasing activity. The regulations describe the Forest Service process for authorizing the BLM to offer leases for sale.

1.7.11 Title 43 CFR 3160: Federal Oil and Gas Regulations

Title 43 CFR Part 3160 provides regulations for all onshore oil and gas operations. The regulations govern operations associated with the exploration, development, and production of oil and gas deposits from leases issued under the direction of the Director of the BLM. The objective of these regulations is to promote the orderly and efficient exploration, development, and production of oil and gas.

1.7.12 Energy Policy Act of 2005

The Energy Policy Act or 2005 directs the Secretaries of the Interior and Agriculture to improve administration of federal oil and gas leasing programs. This includes the improvement of inspection and enforcement of oil and gas activities. It also requires the development and implementation of BMPs. In addition, it requires the Secretaries of the Interior and Agriculture to enter into a MOU to improve coordination and consultation on oil and gas leasing activities. The Secretaries of Agriculture and Interior entered into a MOU in April 2006. The purpose of the MOU was to satisfy requirements of the Energy Policy Act of 2005 and to establish joint BLM and Forest Service policies and procedures for managing oil and gas leasing and subsequent actions.

1.7.13 Onshore Oil and Gas Order Number 1

In March 2007, Onshore Oil and Gas Order Number 1, Approval of Operations, was revised (72 FR 10308). The order provides the requirements necessary for the approval of all proposed oil and gas exploratory, development, or service wells and their subsequent well operations, including abandonment, on all federal oil and gas leases. The order includes leases where the surface is managed by the Forest Service. The revisions were necessary due to provisions in the FOOGLRA, the Energy Policy Act of 2005, legal opinions, court cases since the original order was issued, and other policy or procedural changes. The revised order assures that the processing of Applications for Permit to Drill (APD) is consistent with the FOOGLRA, and clarifies the regulations and procedures that are to be used when dealing with split estate lands. The revised rule also addresses using Master Development Plans, encourages the voluntary use of BMPs as part of APD processing, and requires additional bonding on certain off-lease facilities.

The Forest Service is responsible only for approving surface disturbing activities on NFS lands and appeals related to Forest Service decisions or approvals. The BLM is solely responsible to provide expertise in the areas of petroleum engineering and petroleum geology in interdisciplinary teams performing environmental analyses for leasing on NFS lands and provide Reason Foreseeable Development Scenario (RFDS) for oil and gas leasing, if requested.

1.7.14 Onshore Oil and Gas Order Number 2

This Order details the BLM's uniform national standards for the minimum levels of performance expected from lessees and operators when conducting drilling operations on Federal and Indian lands (except Osage Tribe) and for abandonment immediately following drilling. The proposed casing and cementing programs shall be conducted as approved to protect and/or isolate all usable groundwater zones (≤ 10,000 mg/L total dissolved solids). The surface casing shall be cemented back to the surface either during the primary cement job or by remedial cementing.

1.8 PUBLIC INVOLVEMENT

The NOI for this EIS was published on July 7, 2006 in the Federal Register, Volume 71, No. 130, pages 38602 – 38604. The publication of the NOI initiated the formal 45-day scoping period. The project has been listed in the quarterly SOPA since April 1, 2006.

A public breakout session regarding the oil and gas leasing analysis and preparation of this EIS was conducted during the Dixie and Fishlake Forest Plan Forum on June 28, 2006. A legal notice was published in the Richfield Reaper on July 5, 2006.

News releases with project scoping information were published in several supplemental publications in June 2006, including the Garfield County Insider, Millard County Chronicle Progress, Richfield Reaper, and Wayne County Insider. Letters were sent to 250 individuals and organizations, and six public meetings were conducted in Beaver, Fillmore, Junction, Loa, Richfield, and Salina, Utah. Finally, due to the time lapse between initial scoping and release of a DEIS, a Corrected NOI was published January 18, 2011 in the Federal Register, Volume 76, No. 11, pages 2881 – 2882.

A Notice of Availability was published in the Federal Register on October 21, 2011 for the DEIS, commencing the 45 day formal comment period, which concluded on December 5, 2011. After receiving comments back about not having access to the air quality monitoring report which is referenced in the DEIS, the FNF made the document available, issued a Notice of Availability in the Federal Register on February 17, 2012 to extend the formal comment period for 45 days.
1.9 Issues

Issues serve to highlight effects or unintended consequences that may occur from the proposed action and alternatives, giving opportunities during the analysis to reduce adverse effects and compare trade-offs for the decision maker and public to understand. The Forest Service separated the issues into two groups: key and non-key issues. Key issues are used in environmental analysis to formulate alternatives, prescribe mitigation measures, or analyze environmental effects. Issues are key because of the extent of their geographic distribution, the duration of their effects, or the intensity of interest or resource conflict.

1.8.1 Key Issues

Issue #1: Wildlife Resources
Activities associated with post-leasing oil and gas exploration and development could cause detrimental impacts to wildlife, including threatened, endangered, proposed, sensitive, migratory birds, and MIS. These impacts could include decreased security due to increased access, displacement, disruption of breeding and rearing of young, death of individuals, direct habitat loss, decrease to population trends, habitat fragmentation, and conflict with existing conservation agreements.

Measurement Indicators:

- Acres and percentage of total suitable habitat and critical habitat areas open to development
- Road density in wildlife habitat (sage-grouse, big game)
- Narrative discussion on potential effects related to fragmentation of existing habitats and populations
- Effects determinations as disclosed in biological assessment required by ESA
- Sensitive species viability determinations as disclosed in required biological evaluation
- Consideration of UDWR management plans and population objectives

Issue #2: Unroaded/Undeveloped Areas (UUA)
Potential change to wilderness quality (intrinsic wilderness attributes brought forth from the Wilderness Act of 1969) of unroaded/undeveloped areas which are generally outside of but contiguous to an Inventoried Roadless Area.

Measurement Indicators:

- Number of acres available for lease in UUA

Issue #3: Visual and Scenic Integrity
Activities associated with post-leasing oil and gas exploration and development could degrade the scenic integrity of the Forest and cause a decrease in visitation and forest use.

Measurement Indicators:
- Narrative of potential visual change
- Duration of changes

Issue #4: Geologic Hazards and Steep Slopes
Ground-disturbing activities associated with oil and gas exploration and the subsequent development of roads, pipelines and production fields may cause a decrease in slope stability within large areas of steep to very steep terrain. This could result in accelerated rates of soil erosion with rapid runoff events followed by a partial sedimentation of our local water bodies.

Measurement Indicators:

- Potential soil loss in tons/acre/year
- Miles of road and acres of disturbance on steep slopes or unstable soils

Issue #5: Water Quality
Activities associated with post-leasing oil and gas exploration and development could cause adverse impacts to ground water and surface water.

Measurement Indicators:

- Level of adverse impact risk to source water protection zones
- Acres of potential well development within 300 feet of surface water

Issue #6: Fisheries
Activities associated with post-leasing oil and gas exploration and development could cause an increase in sedimentation and otherwise degrade cold water aquatic habitat and watershed conditions, resulting in changes in habitat, food production, and declining recruitment of trout, and reduce the sustainability of native trout populations.

Measurement Indicators:

- Increase in sediment level above baseline
- Changes to instream habitat structure

Issue #7: Vegetation
Activities associated with post-leasing oil and gas exploration and development could cause individual endangered, threatened, sensitive and/or MIS plants or plant populations to be negatively impacted. Noxious weed populations could increase as a result of ground disturbance associated with oil and gas exploration and development.

Measurement Indicators:

- Acres of potential ground disturbance
- Development potential in habitat for species of concern
- Effect determinations disclosed in required biological assessment (T&E species)
- Impact determinations disclosed in required biological evaluation (FS Sensitive species)

Issue #8: Air Quality
Activities associated with post-leasing oil and gas exploration and development could result in emitting atmospheric pollutants including fine particulates, NOx and volatile organic compounds, degrading air quality.

Measurement Indicators:

- Change in air quality above ambient conditions
- NAAQS Exceedances
- Change in visibility compared to natural background conditions
- Increase in greenhouse gas emissions

Issue #9: Social/Economic
Lack of opportunities to lease federal land for oil and gas exploration and development could cause a shortage of domestic oil and gas supplies, and result in high prices for gas and oil. A shortage of domestic oil and gas supply results in dependence on foreign energy supplies.

Measurement Indicators:

- Percentage of available land approved for leasing availability
- Revenue potential

1.8.2 Non-key Issues

Three issues were considered non-key and not warranting further analysis. These issues are presented below along with the rationale for why they are not analyzed in this EIS:

1. Noxious Weed Spread

The "Standard Lease Terms," state that the "Lessee must conduct operations in a manner that minimizes adverse impacts to the land…" and the "…lessee must… reclaim the land as specified by the lessor…" The FNF has specified operation and reclamation standards that mitigate noxious weed increase due to oil and gas exploration and development. The Fishlake National Forest Oil and Gas Construction and Operating Standards and Well Site Design Requirements (Appendix F) contain the following provisions to mitigate noxious weed population increase:

Prior to vegetation disturbance/removal all noxious weeds must be removed from the site and handled by approved methods needed to prevent spread of seeds.

All vegetation materials, seeds, soil amendments, and sediment control materials must be certified that no noxious weed seed or noxious weeds are present. The operator is responsible for control and eradication of noxious weeds in project area, and the control and eradication of any invasive plant species not present at the site prior to operations, until such time as reclamation standards are met and the company is relieved of further reclamation responsibilities.

Vehicles and equipment shall be free of mud, soil, plant materials, and other debris which could contain noxious weed seeds prior to coming onto the Forest. This is needed to avoid transporting noxious weeds, or invasive species to sites on the Forest.

With these mitigation measures in place along with the small number of acres of expected disturbance noxious weed increase as a result of ground disturbance associated with oil and gas exploration and development is mitigated to the point that it would not be a key issue.

2. Inventoried Roadless Areas

Of particular importance to maintaining wilderness potential in IRAs, road construction and reconstruction is not allowed in an IRA. Accordingly, no direct effects to the roadless character or wilderness potential of IRAs would occur under any of the alternatives analyzed in the EIS. Further, the IRAs are protected under a NSO stipulation under Alternatives C and D, and with a Lease Notice under Alternative B that would prohibit road construction or reconstruction in IRAs. The Forest Service has identified the key issue relative to IRAs as potential impacts to unroaded and undeveloped areas adjacent to IRAs. Roadless or wilderness character of unroaded and undeveloped areas which are generally outside of but contiguous to an IRA will be addressed in this EIS.

3. Cultural Resources

The National Historic Preservation Act (NHPA) and Executive Order 11593 require the protection and enhancement of cultural and heritage resources by the Federal government. Title 36 Code of Federal Regulations, Part 800, Section 106 details the process by which agencies determine whether undertakings will adversely affect heritage resources and how the agencies consult to avoid, minimize or mitigate the effects of the undertakings. The Section 106 process of the NHPA requires consultation with the appropriate agencies to develop and evaluate alternatives or modifications to all of the proposed undertakings for oil and gas development in order to avoid, minimize or mitigate adverse effects to cultural resources.

This leasing analysis and subsequent decision is programmatic in nature, and is conducted to determine which land is suitable to offer for oil and gas leasing, and which pieces of land have known characteristics that should be protected with a lease stipulation, when and if those pieces of land are considered for oil and gas exploration and development. There are known pieces of land that contain culturally important resources deemed appropriate for protection under a lease stipulation. These parcels of land are the Old Spanish Trail, the Paradise Valley area, and the Gooseberry area. These areas have all been placed under a NSO stipulation.

On land that is not placed under a lease stipulation, either for cultural resource or other resource protection, prior to any ground disturbing activity associated with oil and gas development, the FNF will identify and evaluate within the active lease areas, those cultural resources that need to have mitigation undertaken. In addition to having the NHPA to guide the Forest Service in protecting cultural resources, the Forest Service has a standard Lease Notice that is attached to all oil and gas leases requiring cultural resource surveys to be completed, and appropriate mitigation developed to protect any found sites (Appendix A). Under SLT&C oil and gas facilities or activities may be moved by up to 200 meters (656 feet) to avoid impacts to those cultural resources that warrant this. As a result, impacts to general cultural resources on the FNF would be avoided or mitigated at or prior to the construction phase.

Consultation with Native American tribes has been on-going throughout the NEPA process and has been conducted under the approach that areas of known concentrations of sites, and not just individual sites, are an important component of Native American concerns.

1.9 FEDERAL LEASING PROCESS

Passage of the FOOGLRA resulted in the establishment of a staged decision making process for consideration of oil and gas leasing activities on NFS lands. The process is designed to accommodate the tentative nature of oil and gas exploration and development. In general, the various steps that are undertaken are:

(1) Forest Service leasing analysis
(2) Forest Service notification to BLM of lands administratively available for leasing
(3) BLM receives expression of interest (EOI) from industry or the public, and forwards to the Forest Service for a letter of consent to lease
(4) Forest Service attaches the appropriate stipulations and lease notices to the lease before returning their recommendation to the BLM.
(5) BLM assessment of Forest Service conditions of surface occupancy
(6) BLM offers lease
(7) BLM issues lease
(8) Application for Permit to Drill (APD) is filed with BLM by a proponent, along with Surface Use Plan of Operation (SUPO)
(9) Forest Service review and approval of lessee's SUPO (requires new NEPA analysis and decision). This is the first ground-disturbing action.
(10) BLM review and approval of lessee's APD, which includes the SUPO and Drilling Plan (DP)
(11) Ensure final reclamation

Based on the Forest Service leasing analysis (step 1 above), the Forest Service decides whether or not lands will be available for leasing and under what conditions (stipulations) the leases will be issued. This EIS will fulfill this step for the FNF. If lands are determined to be available for leasing, the FOOGLRA requires that leases be offered first for competitive leasing at an oral auction. Noncompetitive leases may be issued only after no competitive bids have been received. After issuance, leases are held for a period of ten years. If oil and/or gas are discovered, the leases continue for the period that oil and/or gas are produced in paying quantities. In the lower 48 states, the maximum competitive lease size is 2,560 acres and the maximum noncompetitive lease size is 10,240 acres.

Industry or individuals submit EOIs to BLM, thereby proposing specific lands be offered for competitive bid. The BLM prioritizes areas to be processed based on the EOIs. The Forest Service and BLM then delineate parcels in the requested areas and identify the required lease stipulations. Finally, each parcel is packaged as a lease to be offered for bid. The BLM has received EOIs to lease certain lands on the FNF, displayed in Figure 1.10-1 below.

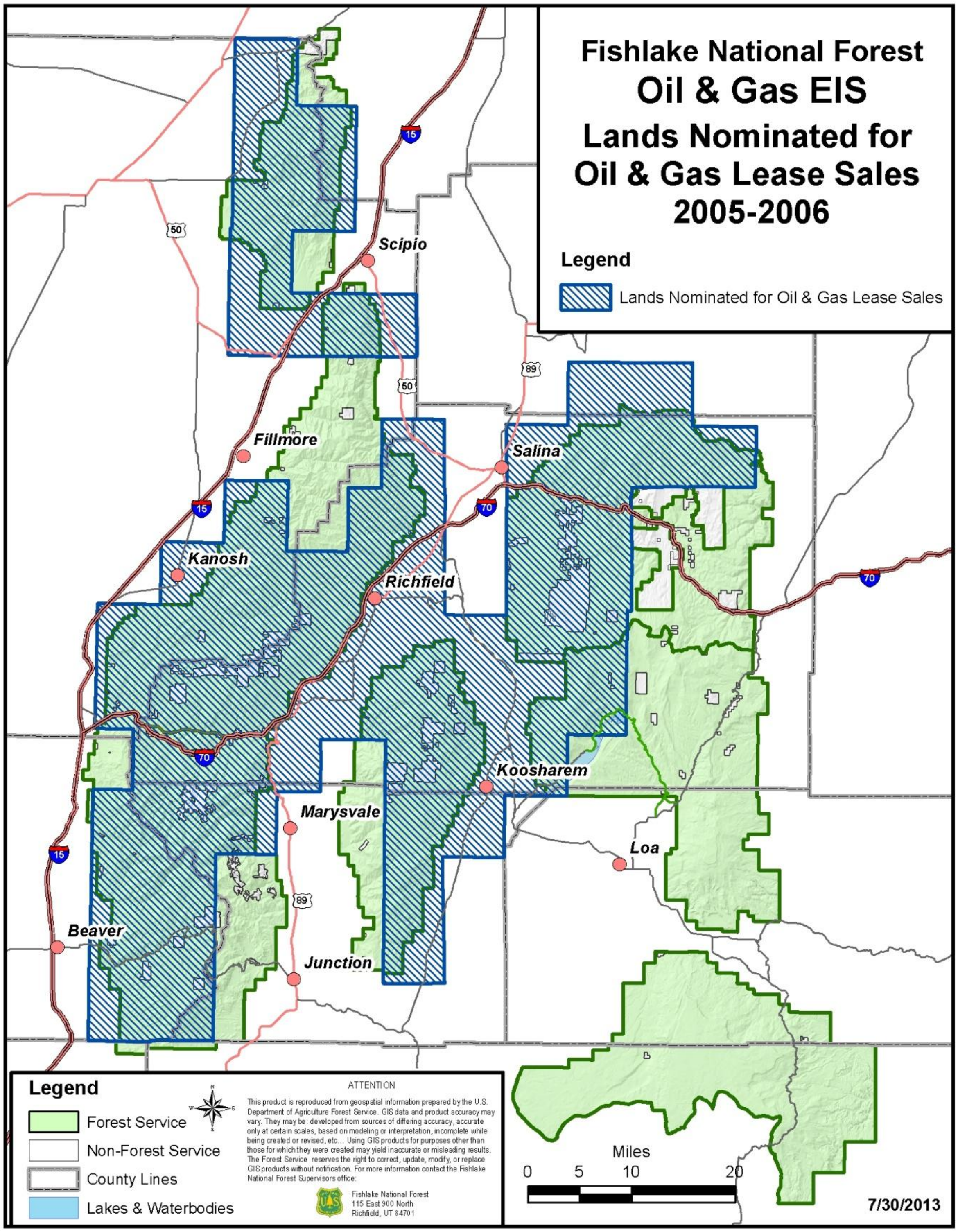


Figure 1.1-1: Lands nominated for lease by Expressions of Interest.

1.9.1 Standard Lease Terms and Conditions

Standard terms and conditions are defined in 43 C.F.R. § 3101.1-2 (2004), which sets a standard under which certain surface-use restrictions are considered to be consistent with lease rights. Standard lease terms and conditions (SLT&C) allow the surface management agency to move new locations for well pads, roads, and pipelines up to 200 meters (656 feet) and can restrict initiation of operations up to 60 days. They require that proposed oil and gas operations be allowed to be sited on the leasehold.

BLM Form 3100-11 describes the rights and restrictions for use and occupancy of the leased land as needed to explore for, drill, extract, remove, and dispose of oil and gas. The lessee or designated operator must conduct operations in a manner that minimizes adverse effects to the land, air, water, cultural, biological, visual, and other resources, as well as other land uses and the public. The lease form and the USDA Lease Notice (required on all leases on NFS lands) discusses mandatory compliance with environmental laws such as the Clean Water Act, Endangered Species Act, and the National Historic Preservation Act.

The guidelines and practices from the following sources would be applied as appropriate to operations on the FNF:

- Gold Book – Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development
- BLM Best Management Practices (BMPs) for Fluid Minerals
- Oil and Gas Roading Guidelines, Region 4 (R-4)
- Fishlake National Forest Oil and Gas Construction and Operating Standards and Well Site Design Requirements
- Onshore Oil and Gas Orders

In addition, the Forest Service has authority to require reasonable mitigations or operating standards for post-lease exploration and development under the MLA and federal regulations (36 CFR 228.106-108; and 43 CFR 3162.3. The FNF has developed Oil and Gas Construction and Operating Standards and Well Site Design Requirements for development of oil and gas leases (USDA Forest Service 2009). These standards and well site design requirements would be required to assure consistency with management objectives for the FNF. Standards must be consistent with the rights and restrictions established in the applicable lease(s) and are applicable to all drilling and production operations, unless otherwise approved by the responsible officer based on site-specific conditions. Operators would be encouraged to obtain these standards from the Forest Service early in the planning and approval process and to incorporate them into their Surface Use Plans of Operations (SUPO) to help streamline the NEPA analysis and approval process.

Additional post-leasing surface use restrictions would be applied as appropriate as Conditions of Approval (COA) to an APD and SUPO. Site-specific COAs would be identified before approval of the SUPO, Drilling Plan (DP), and APD, provided that they do not require location of the proposed operations outside of the limits of the standard terms and conditions. An operational restriction in the form of a COA constitutes a reasonable measure required by the authorized officer to minimize adverse impacts to other resource values, land uses or users not addressed in the lease stipulations. "Reasonable measures" must be consistent with lease rights granted to the lessee, and the impact that the restriction has on the viability of the lessee's proposed operations must be considered. A restriction that renders the lessee's operations economically or technically not viable is not "reasonable" under § 3101.1-2.

Other standards or mitigations may be required based on site-specific evaluations of proposed activities and they may be modified, if needed, to address site-specific conditions. Operators are required to comply with all other applicable laws and regulations.

1.9.2 Lease Stipulations, Lease Notices and Conditions of Approval

A lease does not convey an unlimited right to explore or develop the encompassed lands. Lease stipulations are designed to address specific resource concerns or potential impacts and allow the government to retain sufficient authority to require protection or mitigation beyond that provided by standard lease terms and conditions. The stipulations modify the rights granted by the lease and standard lease terms and generally relate to occupancy of leases and timing of operations. They are incorporated into the lease as an official attachment to the standard form. Potential lessees are made aware of stipulations prior to any lease sale. These stipulations include No Surface Occupancy, Timing Limitations, and Controlled Surface Use. Lease Notices would be utilized to notify potential lessees of specific conditions or restrictions already in place by law or regulation.

The Rocky Mountain Regional Coordinating Committee published "Uniform Format for Oil and Gas Stipulations" in March 1989. A uniform format for stipulations was developed for No Surface Occupancy, Timing Limitations, and Controlled Surface Use. This guidance also includes the use of Lease Notices. These formats have been adopted for nationwide use. The BLM regulations also contain provisions for special administration or unique stipulations, such as those required by prior agreements between agencies or other instances when standardized forms are not appropriate.

Exceptions, modifications, or waivers to the proposed lease stipulations may be granted if oil and gas operations could be conducted without causing unacceptable impacts. Exceptions, modifications, or waivers must be consistent with the approved Forest Plan and all applicable regulatory provisions. If the Forest Supervisor determines that the waiver, exception, or modification involves an issue of major public concern, the waiver, exception, or modification would be subject to a 30 to 90 -day public review period (36 CFR § 219.8). If an action is not consistent with the Forest Plan, a plan amendment would be developed after analysis under NEPA.

No Surface Occupancy: The NSO stipulation is intended for use only when other stipulations are determined insufficient to adequately protect the public interest. Where an NSO stipulation is in effect, no ground disturbance is allowed. The suitability and acceptability of constructing a road, pipeline, or similar linear facility outside of the subject lease would be evaluated using Forest Plan standards and guidelines, the same as roads related to other resource uses.

Timing Limitations: The TL stipulation prohibits oil and gas exploration and development activities for specified periods. This stipulation does not apply to the operation and maintenance of production facilities unless the analysis findings demonstrate the continued need for such mitigation and conclude that less stringent, project-specific mitigation measures would be insufficient.

For example, a Timing Limitation might be used to protect an elk calving area during the elk calving period, or to prevent excessive soil erosion and stream sedimentation resulting from construction activities during periods when soils are saturated. The Timing Limitation would not allow surface use during a prescribed period of time on all or a portion of the lease. The Timing Limitation may also specify the restrictions apply when certain surface conditions exist, such as water-saturated soils or during spring thaws when roadbeds are too soft to allow traffic without unacceptable damage to the road.

Controlled Surface Use: The CSU stipulation is intended for use when surface occupancy for oil and gas exploration or development is generally allowed, but lease activities need to be strictly designed or controlled due to special values or resource concerns. The CSU stipulation is used to identify constraints on surface use or operations that may otherwise exceed the mitigation provided by the standard lease terms and conditions and Onshore Oil and Gas Orders.

The use of CSU stipulations should be limited to areas where restrictions and controls are necessary for specific types of activities within the specific affected environments, rather than all activity on the lease. The stipulation should clearly describe the activity to be controlled or what operational constraints are required and must identify the applicable area and the reason for the requirement. For example, a CSU stipulation might be used to protect the Visual Quality Objective (VQO) of an area. In this case, the CSU stipulation would require operations be located and designed to meet the specific VQO, normally within a specified time period (i.e., within one year).

Lease Notice: A Lease Notice (LN) is attached to leases to transmit information at the time of lease issuance to assist the lessee in submitting acceptable plans of operation, or to assist in administration of leases. Lease Notices do not involve new restrictions or requirements, but simply identify specific requirements related to law, regulation, standard lease terms and conditions, or Onshore Oil and Gas Orders.

Conditions of Approval: A COA is a site-specific requirement included in an approved APD or Sundry Notice that may limit or amend the specific actions proposed by the operator. COAs minimize, mitigate, or prevent impacts to public lands or other resources. BMPs may be incorporated as a COA.

1.9.3 Post-Lease Permitting Process

After obtaining a lease and prior to conducting any surface disturbing activities, lessee(s)/operator(s) must obtain approval from the responsible agencies through the federal permitting process. Even though permitting of post-lease surface disturbing operations is a separate connected process subsequent to leasing, it is described here to inform the reader of the progressive staged leasing and permitting process and the distinction between lease stipulations, BMPs, and operating standards or mitigations. This information is needed to better understand the leasing process and how the agencies use lease stipulations in their respective leasing decisions. All operations are subject to applicable laws and regulations, operating standards, BMPs established by the agencies, and lease stipulations.

The permitting process on National Forest System lands must proceed as required in BLM regulations (43 CFR 3160); Onshore Oil and Gas Operations; and Forest Service regulations (36 CFR 228.106 and 107). Onshore Oil and Gas Order No. 1, issued by BLM under these regulations, details the requirements for submitting, reviewing, and issuing APDs and Sundry Notices (other operations and facilities).

Two options for submitting applications are provided in Onshore Oil and Gas Order No. 1. One option allows for initial submittal of an APD. Another option, which is strongly encouraged for exploration wells, allows for submittal of a preliminary, abbreviated application called a Notice of Staking (NOS), prior to submittal of an APD. The NOS is submitted to BLM notifying the agencies that an operator has staked a proposed drilling location on leased lands and has flagged a proposed road alignment to access the location. If determined to be complete, the BLM forwards the NOS to the Forest Service to initiate the review process. The agencies and operator conduct an on-site review of the location within 15 days of receipt, depending on weather conditions and availability of qualified personnel. The agencies review proposed operations with the operator for consistency with the surface occupancy and timing stipulations, if any, in the respective lease(s). If not consistent with lease stipulations, and/or as negotiated with the operator, the proposed drilling and access locations are adjusted to a suitable location. This process provides for adjustment of the locations prior to the operator expending significant funds for detailed surveys, project engineering, and resource surveys.

The operator is also provided with design and operating standards required by the agencies to mitigate effects and informed of the agencies requirements for conducting resource inventories in the project area prior to conducting environmental analyses. Based on this information, the operator then prepares the APD. Since the operator is aware of these requirements prior to detailed planning of proposed operations, the APD review process can often be more efficient and timely. With this information, the operator can also propose to contract qualified third-party specialists to conduct resource inventories to speed up the review process.

To obtain approval of drilling for both exploration and production wells, APDs are submitted to the BLM. An APD contains two parts: the Drilling Plan and the SUPO. The BLM reviews the APD for completeness. If not complete, BLM informs the operator and works cooperatively to obtain a complete application. Once determined to be complete, BLM forwards the APD to the Forest Service for review and approval of the SUPO. The determination of completeness starts the review and approval process by the agencies. The BLM manages the mineral estate and is responsible for review and approval of the sub-surface DP. The Forest Service, as the surface management agency, is responsible for review and approval of the SUPO and to assure operations are conducted to minimize environmental effects.

The BLM and Forest Service cooperatively conduct an analysis to determine and disclose the potential effects of proposed operations in accordance with NEPA. If an Environmental Assessment (EA) or EIS is needed, the agencies would prepare a single analysis that would satisfy the analysis and documentation needs of each agency. Based in a single NEPA document, if needed, the agencies then prepare their respective decision documents with any COAs, consistent with established lease rights, needed to mitigate effects. If proposed operations qualify for Categorical Exclusion (CE) under agency rules or the Energy Policy Act of 2005, each agency would most likely prepare separate but coordinated analyses and decisions. The BLM approves the APD with COAs, if required by either agency. Operations may not begin until all permits required by federal, state, and county agencies are secured and required reclamation/performance bonds are posted with the responsible agency.

Sundry Notices are submittals by an operator to BLM to inform them of actions completed to meet regulatory requirements or to propose operations other than drilling, covered in an APD. Examples would include ancillary production facilities such as compressor stations, pumping stations, pipelines, or powerlines. Sundry Notices that propose new surface disturbing activities are reviewed and approved by a process similar to that for APDs.

Compliance inspections are conducted by all permitting agencies under applicable regulations and interagency agreements. The Forest Service is responsible for compliance with the SUPO, other surface disturbing operations, and Forest Service road-use and special-use permits. The BLM is responsible for compliance with drilling plans and production and downhole operations. The BLM and Forest Service also conduct joint inspections and inform each other of any non-compliance determinations and enforcement actions.

1.9.4 Mitigation Measures/Conditions of Approval (Post-Lease Activities)

Mitigation measures may include the operating standards discussed in the previous sections and other site-specific measures required by the agencies to mitigate potential effects. Operating standards are usually in place prior to receipt of applications and are provided to operators at first contact regarding their proposals. Mitigation measures are determined during the process of reviewing post-lease applications for operations and are included in the appropriate permits. If operating standards provided to an operator are not included in their project plans, they can be included as COAs in permits. The terms "mitigation measures" or "Conditions of Approval" are used by the BLM to distinguish them from lease stipulations. Under standard lease terms and conditions (43 CFR 3100 and 36 CFR 228E) basic mitigation measures can be required to minimize effects and protect non-mineral interests. These COAs must be consistent with the rights granted under the applicable lease(s).

1.9.5 Bonding

The operator must furnish a lease bond of at least $10,000 before beginning any surface-disturbing activities related to drilling. In lieu of individual lease bonds, operators may furnish a bond in an amount of not less than $25,000 covering all leases and operations in any one state, or a bond in the amount not less than $150,000 covering all leases and operations nationwide.

The bond is intended to ensure compliance with all lease terms, including protection of the environment. The BLM may increase the bond amount any time conditions warrant such an increase, or the Forest Service can require additional bonding (36 CFR 228.109).

1.9.6 Rentals and Royalties

In the first five years of the lease, annual rental rates for competitive and noncompetitive leases are $1.50 per acre or fraction of the acre. After the first five years, annual rental rates increase to $2.00 per acre. The royalty rate on production is 12.5 percent for both competitive and noncompetitive leases.

1.9.7 Expiration or Termination of a Lease

Oil and gas leases expire at the end of their primary term. The primary term is ten years for competitive and noncompetitive leases. Leases that produce paying quantities of oil or gas do not expire until production ends. Leases without producible wells automatically terminate if the lessee fails to make full and timely payment of the annual rental. The rental must be received by the federal government on or before the anniversary date of the lease.

The owner of a lease also may relinquish the lease in whole or in part by filing a written relinquishment with the BLM State Office having jurisdiction over the leased federal lands. A relinquishment takes effect on the date it is filed. The lessee is responsible for plugging any abandoned wells and meeting standards of reclamation. The lessee or operator also is responsible for other work required by the BLM to place the leasehold in proper condition for abandonment and bring the lease account into good standing. If the lessee or operator fails to perform the required abandonment work, the bond will be used to pay for the costs of abandonment and reclamation, and the lessee will be prohibited from leasing any additional federal lands.

1.10 OIL AND GAS POTENTIAL AND REASONABLY FORESEEABLE DEVELOPMENT

1.10.1 Historic Oil and Gas Activities

Historically there have been 21 exploration wells drilled within the FNF. Two of these were offset from original locations that could not reach planned depth. The first recorded well was drilled in 1953 and the last well was drilled in 1982. None of the wells went into production, although some oil staining and natural gas were reported. Carbon dioxide was reported but not put into production. No leasing has occurred in the project area since 1982.

Currently one oil and gas lease encompassing 301.7 acres exists on the FNF. It is located on a parcel transferred to federal ownership from the State of Utah under the Utah Schools and Lands Exchange Act of 1998. This State oil and gas lease (UTU-078183) was transferred to federal administration when the surface and mineral estates were transferred to federal ownership. It is included within the federal unit associated with the Covenant Oil Field located just southeast of the town of Sigurd, Utah, on private and BLM lands in Sevier County.

Recent discoveries on adjacent lands with similar geology indicate there is potential for discoveries in the future. The most notable is discovery and development of the Covenant Oil Field by Wolverine Gas and Oil in 2004, which renewed interest in the Sevier Fold-and-Thrust Belt. The associated oil and gas play is known as the Sevier Frontal Zone Play. This area is of special interest because it contains numerous geologic structures capable of trapping hydrocarbons, similar to the structure associated with the Covenant Field. The BLM has received numerous Expressions of Interest for leasing on the Fishlake National Forest since the 2004 discovery.

1.10.2 Reasonably Foreseeable Development Scenario

In order to analyze the effects of leasing, the analysis must be based on the type and amount of reasonably anticipated post-lease activity. The BLM and Forest Service cooperatively prepared the Reasonably Foreseeable Development Scenario (Appendix C). These determinations were used as the basis for assessing the effects of leasing as presented in this EIS. Table 1.12-1 displays the development potential and number and type of wells predicted for each of the identified potential oil and gas plays.

Table 1.12-1: Predicted Number and Type of Wells.

PLAY	DEVELOPMENT POTENTIAL	EXPLORATION WELLS	PRODUCTION FIELD WELLS	TOTAL WELLS
Sevier Frontal Zone Play	High	43 Exploration Two additional exploration wells would make discoveries leading to field development (included in column to right)	1 field 10 wells (Includes one discovery well)	10+ wells
Other Plays	Low - High		1 field 20 wells (Includes one discovery well)	20+ wells
Total fields/wells		43 wells	2 fields 30 wells	73 wells

Table 1.12-.2 displays the predicted surface disturbance for exploration activities, and for two reasonably foreseeable new oil production fields. The total or gross surface disturbance for all operations as well as the net surface disturbance is presented. The net surface disturbance excludes those portions of the roads and pads most likely to be reclaimed during the analysis period for exploration wells that are not converted to production or water disposal wells.

Table 1.12-2: Predicted Surface Disturbance.

ACTIVITY/FACILITY	NUMBER/LENGTH OF FACILITIES	GROSS AREA OF DISTURBANCE (ACRES)	NET AREA OF DISTURBANCE (ACRES)
SEISMIC SURVEYS			
Articulated Buggies	325 line miles	392	0
Helicopter	325 line miles	2	0
Disturbance Subtotal	650 line miles	394	0
EXPLORATION DRILLING			
Drill Pads	43 pads*	254	0
New Project Roads	32.2 miles	198	0
Reconstruction of Existing Roads	111.4 miles	189	0
Disturbance Subtotal	N/A	641	0
SEVIER FRONTAL PLAY FIELD			
Central Production Facilities Pad	1 pad	12	12
Production Pads	3 pads	18	18
Water Injection Well Pad	1 pad	6	6
New Project Roads	4.2 miles	26	26
Reconstruction of Existing Roads	2.6 miles	4	4
Powerlines	5 miles	25	25
Pipelines and Truck	5 miles	31	31

ACTIVITY/FACILITY	NUMBER/LENGTH OF FACILITIES	GROSS AREA OF DISTURBANCE (ACRES)	NET AREA OF DISTURBANCE (ACRES)
Pullout/Loading Areas	1 pullout		
Disturbance Subtotal	NA	122	122
CONVENTIONAL FIELD (Not in Sevier Frontal Play)			
Central Production Facilities Pad	1 pad	12	12
Production Pads	19 pads**	112	76
Water Injection Well Pad	1 pad (included above)	included above	included above
New Project Roads	12.6 miles	78	78
Reconstruction of Existing Roads	2.6 miles	5	5
Powerlines	5 miles	25	25
Pipelines and Truck Pullout/Loading Areas	5 miles 1 pullout	31	31
Disturbance Subtotal	NA	263	227
TOTAL	650 line miles seismic 68 pads 49 miles new road 117 miles reconstruction 10 miles powerline 10 miles pipeline	1,421	350

* All new exploration pads and roads not resulting in a discovery would be reclaimed within 5 years.

** The 19 production pads for the conventional oil field would be reduced to 4 acres from the original drill pad size of 5.9 acres. The unneeded portion of the pad would be returned to approximate original contour and revegetated.

2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

2.1 INTRODUCTION

This chapter describes and compares the alternatives considered for the Fishlake National Forest Oil and Gas Leasing Analysis. It includes a description and map of each alternative considered. This section also presents the alternatives in comparative form, sharply defining the differences between each alternative and providing a clear basis for choice among options by the decision maker and the public. Some of the information used to compare the alternatives is based upon the design of the alternative and some of the information is based upon the environmental, social and economic effects of implementing each alternative.

2.2 ALTERNATIVES CONSIDERED IN DETAIL

Alternatives were developed based on the results of scoping and the determination of issues to be analyzed in detail. The alternatives were then refined through internal discussion with FNF resource specialists and through involvement with cooperating agencies and interested parties. The Forest Service developed four alternatives, including the No Action and Proposed Action alternatives, in response to issues raised by the public and industry. Alternative D was developed specifically to include the components and elements requested by UEC, and the organizations they partner with (comment letters are available for review in the administrative record).

2.2.1 Alternative A: No Action/No Lease

Under Alternative A, present management activities pertaining to oil and gas leasing would continue unchanged. As the current LRMP does not make specific decisions about which lands are available for leasing, the Forest Supervisor under this alternative would not make any new leasing decisions and no new oil and gas leasing would be allowed on the FNF. The Forest Supervisor can also select a forest-wide No Lease Alternative that would not allow leasing anywhere on the Forest. This would be different from not taking any action, as in the No Action Alternative, since a decision would be made that would prohibit leasing. Both options would result in no new oil and gas leasing and have been combined for analysis purposes.

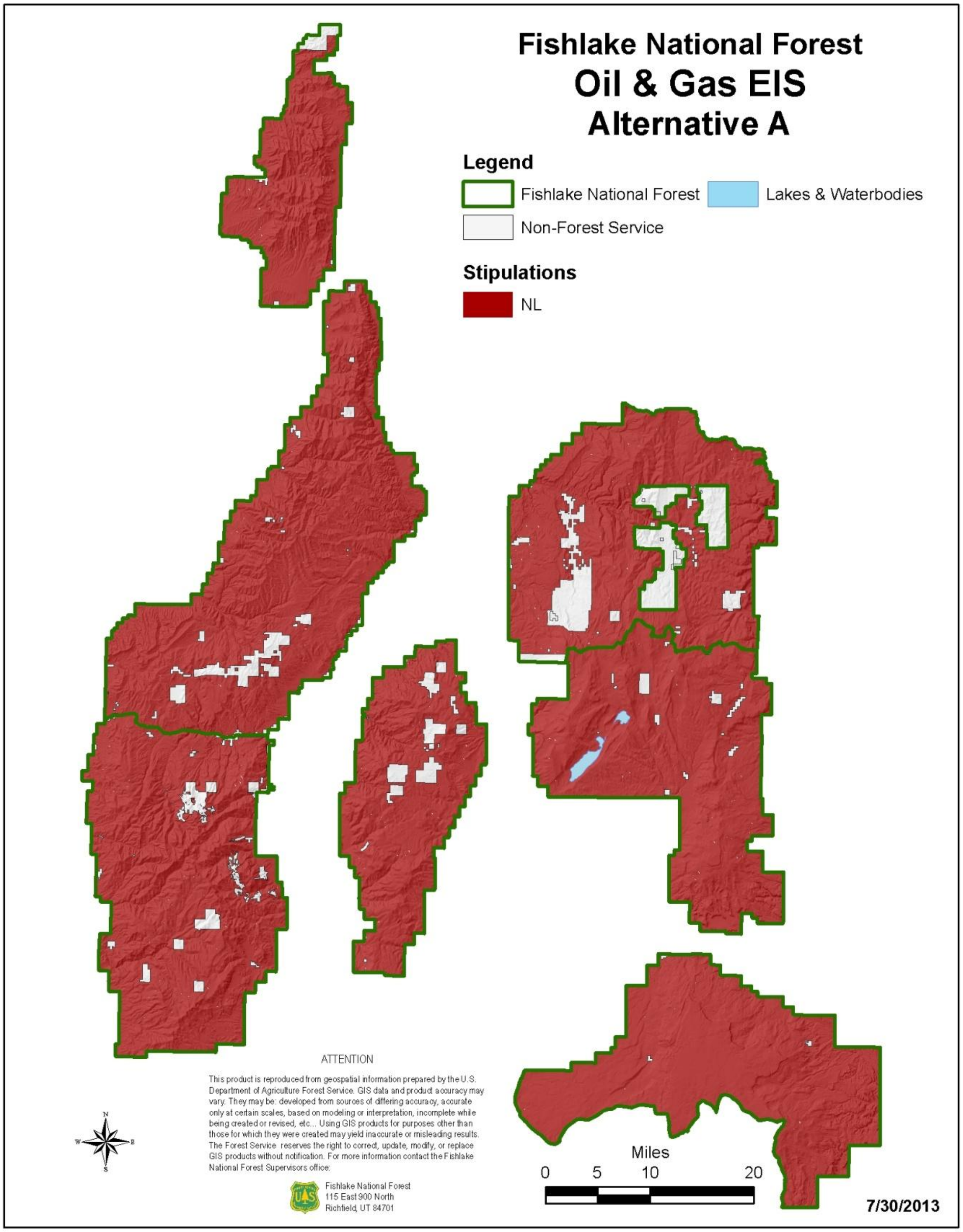


Figure 2.2-1: Alternative A: No Action/No Lease

2.2.2 Alternative B

Under this alternative, all lands administered by the FNF would be administratively available for leasing with SLT&C, with the exception of Mexican spotted owl (MSO) Protected Activity Centers (PAC), and Class I airshed areas. Spotted owl PACs would be under a NSO stipulation, and Class I airshed areas would be under a CSU stipulation (See Appendix A). Existing laws and their implementing regulations, and reasonable operating standards or mitigation measures required by the permitting agencies would also apply. Laws that require specific protection of resources for all activities which could affect operations regardless of lease stipulations include, but are not limited to, the Endangered Species Act, Migratory Bird Treaty Act, National Historic Preservation Act, Clean Water Act, and Clean Air Act.

BMPs developed by BLM and Forest Service, required under the Energy Policy Act of 2005 would be required by the agencies, as applicable considering site-specific conditions. Agency requirements for road designs and other operating standards developed by the Forest, consistent with the rights granted by a lease, would be required (43 CFR 3101.1-2). These standards would be given to operators during the first meeting regarding any proposed post-lease operations with the intent they would be used by the operator when planning the project and developing APDs or Sundry Notices for submittal to the BLM and Forest Service. If applications are not consistent with these standards, the agencies would evaluate their applicability based on site-specific conditions and work with the operator to appropriately address them in the applications or otherwise require them as COAs.

Lease Notices

Lease Notices would be included in leases to inform prospective bidders of restrictions required by law or regulation regardless of lease stipulations. These restricted areas are as follows:

- Required protection of threatened, endangered, and proposed species under the Endangered Species Act
- Required protection of cultural and paleontological resources under the National Historic Preservation Act and other related laws
- Restrictions on road construction or reconstruction (none allowed) in Inventoried Roadless Areas
- Municipal and Transient Water Source Protection Zones
- Other Lease Notices would be included in new leases if new non-discretionary laws or regulations were passed with restrictions that would likely affect oil and gas operations.

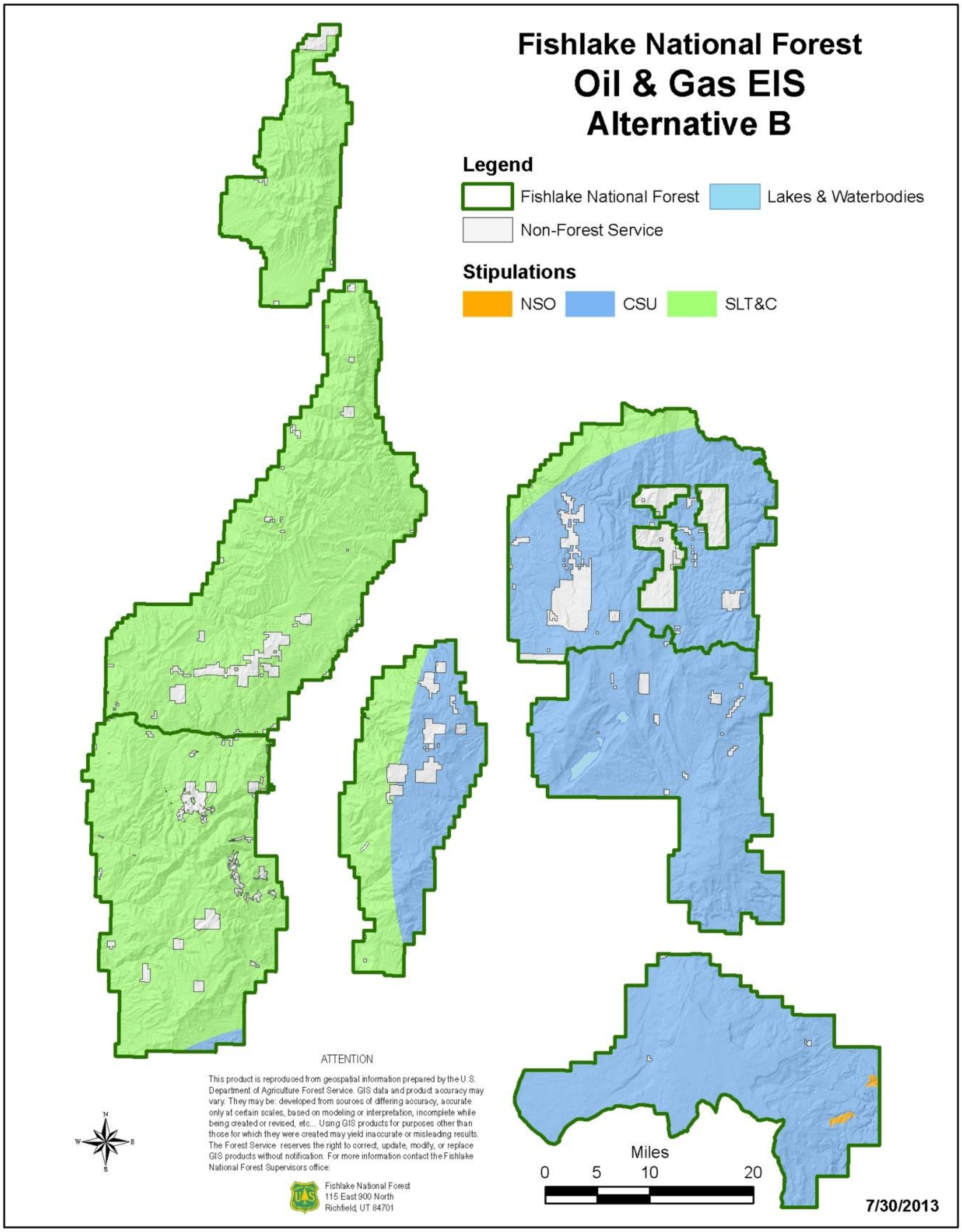


Figure 2.2-2: Alternative B

2.2.3 Alternative C: Preferred Alternative

The proposed action is to make all lands managed by the Fishlake N.F. administratively available for leasing, subject to the terms and conditions of the standard oil and gas lease form 3100-11 (BLM 2006a), or subject to constraints that would require the use of lease stipulations. In addition, the Fishlake and Dixie Forest Supervisors would approve non-significant Forest Plan amendments to update direction for oil and gas leasing, and surface protection. Where the FS consents to leasing and the Secretary of Interior decides to issue a lease, the authorized officer (BLM State Director) would incorporate the following stipulations where appropriate into any lease which it may issue.

No Surface Occupancy

The following areas would be leased with the NSO stipulation. In some cases a waiver, exception, or modification may be granted:

- All Research Natural Areas
- Inventoried Roadless Areas
- Quitchupah Canyon Cultural Area
- Paradise Valley Cultural Resource Site
- Old Spanish Trail Corridor
- Areas with steep slopes (greater than 35% or North Horn sediment areas with slopes greater than 25% slope)
- Areas of Geologic Hazards or Unstable Soils
- Areas within one mile of known federal TEP plant locations
- Areas within one mile of Sensitive plant locations covered under a conservation agreement
- Areas within 300 feet of riparian areas, wetlands, lakes, reservoirs, perennial streams, and springs
- Drinking Water Source Protection Zones – Zones 1 – 3, and T2 and T4
- Mexican spotted owl PACs
- Bald eagle winter concentration areas
- Goshawk Core Nesting Areas
- Within four miles of sage-grouse leks
- Known colonies of pygmy rabbits
- Key habitats for boreal toad
- Within ¼ mile of developed recreation sites and National Recreation Trails
- Within ¼ mile of Forest Service administrative sites and facilities
- Frequently viewed areas of high scenic integrity

Timing Limitation

The following areas would be leased with a Timing Limitation (TL) stipulation:

- Sage grouse brood-rearing areas (May 1 to July 5)
- Sage grouse wintering habitat (December 1 – March 15)
- Crucial elk and mule deer winter range (December 1 to April 15)
- Bighorn sheep lambing, crucial elk calving and mule deer fawning areas (May 1 to July 5)
- Bighorn sheep winter range (November 1 to April 15)

Controlled Surface Use

The following areas would be leased with the Controlled Surface Use (CSU) stipulation:

- Goshawk post-fledging areas
- Active raptor nest areas as determined by USFWS
- Class I Airsheds

Lease stipulations for all categories are fully described in Appendix A. Lease stipulation maps are contained in Appendix B.

Lease Notices

Lease Notices would be included in leases to inform prospective bidders of restrictions required by law or regulation regardless of lease stipulations. These restricted areas are as follows:

- Required protection of Threatened, Endangered, and Proposed species under the Endangered Species Act including Mexican Spotted Owl, California Condor, Western Yellow-billed Cuckoo, and Utah Prairie Dog.
- Required protection of Migratory Birds
- Required protection of Sensitive and Management Indicator Species (Plants and Wildlife)
- Required protection of cultural and paleontological resources under the National Historic Preservation Act and other related laws
- Required protection of air resources.
- Compliance with State of Utah surface, ground and transient water source protection and other water resource requirements.

Other Lease Notices would be included in new leases if new non-discretionary laws or regulations were passed with restrictions that would likely affect oil and gas operations.

The proposed action would not authorize specific, surface-disturbing activities. It only prescribes which lands would be available for oil and gas leasing and what conditions and stipulations would apply to any future oil and gas leases offered. Environmental impacts of future oil and gas exploration and development activities would undergo future, project-specific environmental analyses.

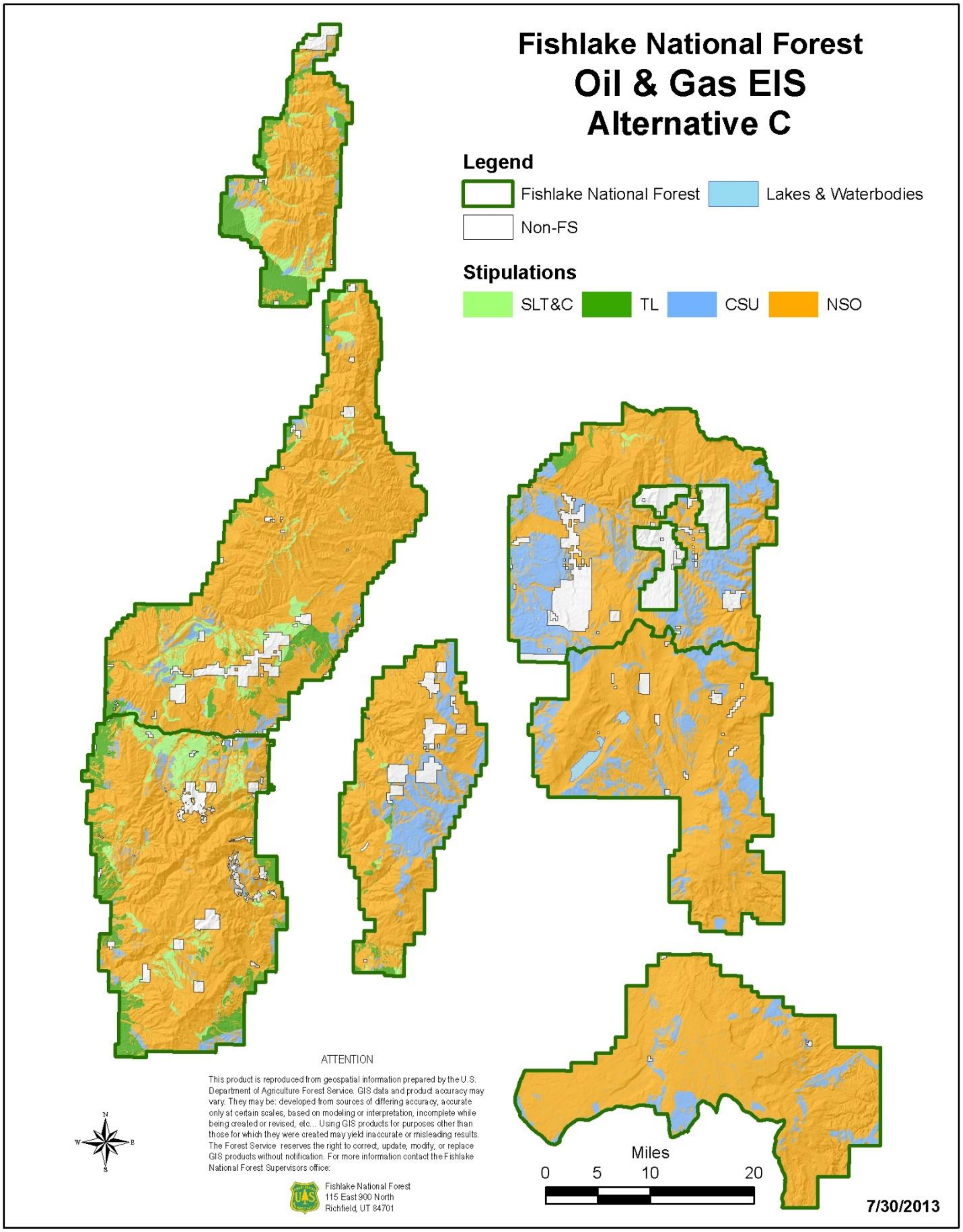


Figure 2.2-3: Alternative C: Proposed Action

2.2.4 Alternative D

This alternative would emphasize the protection of non-mineral resources and uses over oil and gas exploration and development activities and the associated economic benefits. The alternative was developed in response to scoping comments submitted by environmental groups, sportsmen, and other groups and individuals who expressed that natural resource protection should be emphasized over oil and gas activities. Alternative D was developed specifically to include the components and elements requested by the Utah Environmental Congress (UEC), and the organizations they partner with. They refer to it as their "SMU" alternative.

No Lease

The following areas would not be available for lease (NL):

- Municipal watersheds
- Campground water systems
- Threatened, Endangered, or Candidate species habitat
- Key habitat areas for the Boreal Toad
- Research Natural Areas
- Inventoried Roadless Areas
- Suitable Wild and Scenic River corridors
- National Recreation Trails
- Quitchipah Canyon Cultural Area

No Surface Occupancy

The following areas would be leased with the No Surface Occupancy Stipulation (NSO) with no waivers, exceptions or modifications:

- Areas with slopes greater than 35 percent
- North Horn sediment areas greater than 25 percent slope
- Sensitive plant habitat within 1 mile of known sites
- Unstable areas
- Known occupied habitat for threatened or endangered species covered under a conservation agreement or recovery plan
- Within 500 feet of perennial streams, wetlands, springs, lakes, reservoirs, and riparian areas
- Bald Eagle winter concentration areas
- Goshawk nesting, nest replacement areas, and post-fledgling areas
- Known colonies and potential habitat for pygmy rabbits
- Within 500 feet of cold water fisheries habitat
- Critical deer and elk range, and calving and fawning areas
- Developed recreation sites
- High Scenic Integrity Areas
- Areas with a primitive Recreation Opportunity Spectrum
- Areas with a Semi-Primitive Non-motorized Recreation Opportunity Spectrum
- Administrative sites and special use facilities

Controlled Surface Use

The following areas would be leased with the Controlled Surface Use Stipulation (CSU):

- Class I Airsheds

Lease stipulations for all categories are fully described in Appendix A. Lease stipulation maps are contained in Appendix B.

Lease Notices

Lease Notices would be included in leases to inform prospective bidders of restrictions required by law or regulation regardless of lease stipulations.

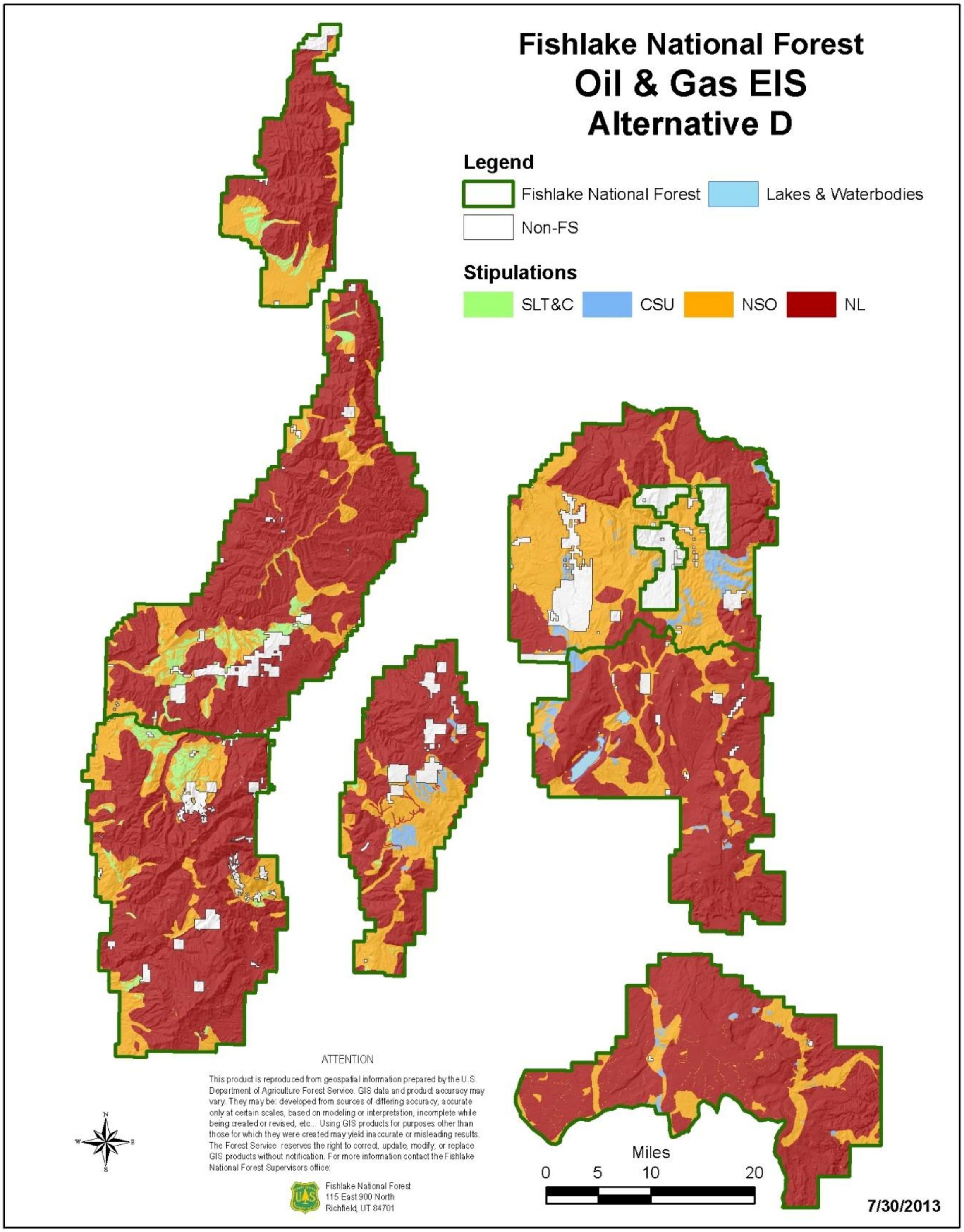


Figure 2.2-4: Alternative D

2.2.4 Mitigation Common to All Alternatives

Specific mitigation measures were not developed for each alternative. Rather, the development of a lease would be expected to adhere to the standards and guidelines contained in Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development – The Gold Book (BLM and USFS 2007), Forest Service Region 4 Oil and Gas Roading Guidelines, Onshore Oil and Gas Orders, and any Fishlake National Forest BMPs in place at the time of lease approval. Further, the FNF has developed additional operating standards and well site design requirements that supplement those already contained in the documents mentioned above. These supplemental guidelines are contained in the Fishlake National Forest Oil and Gas Construction and Operating Standards and Well Site Design Requirements (Appendix F). Copies of this document will be made available to potential lessees at the time lands are offered for lease. Further, as each project would undergo additional NEPA analysis, site-specific BMPs, environmental protection measures, and potential mitigation would be developed at that time.

2.3 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED STUDY

Federal agencies are required by NEPA to rigorously explore and objectively evaluate all reasonable alternatives and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 CFR 1502.14). Public comments received in response to the Proposed Action provided suggestions for alternative methods for achieving the purpose and need.

An alternative that would make all legally open lands available for leasing with the NSO stipulation was considered but dismissed. This alternative would essentially be the same as the No Action alternative because no surface occupancy or development would be allowed on NFS lands. Consideration of the NSO stipulation for specific areas was included in some of the action alternatives. A Forest-wide NSO alternative would not be reasonable or justified for all areas of the FNF, nor would it be consistent with national and Forest Service policy on minerals exploration and development.

2.4 COMPARISON OF ALTERNATIVES

This section provides a comparison of the elements of each alternative, and of the effects of implementing each alternative. Information in Table 2.4-1 provides a summarized comparison of each alternative relative to the amount of land available for lease under each stipulation. Tables 2.4-2 to 2.4-4 provide a summarized comparison of the effects of each alternative by issue.

Table 2.4 - 1: Area Available for Leasing Under Each Alternative by Stipulation

Availability/Leasing Stipulation	Alternative A	Alternative B	Alternative C	Alternative D
ABBREVIATIONS NA – Not applicable or not applied to alternative. NL – No Lease. SLT&C – Standard Lease Terms and Conditions. NSO – No Surface Occupancy. TL – Timing Limitation. CSU – Controlled Surface Use. LN – Lease Notice.				
NFS Lands/Federal Oil and Gas	1,707,810	1,707,810	1,707,810	1,707,810
Non-Federal Lands/Federal Oil and Gas	N/A	N/A	N/A	N/A
Legally Open to Leasing	All	All	All	All
No Lease	100%	0%	0%	72.6%
SLT&C	0%	51.4%	3.7%	1.9%
TL	0%	0%	4.8%	0%
NSO	0%	0.1%	79.3%	23.9%
CSU	0%	48.5%	12.2%	1.6%
Total	100%	100%	100%	100%

Table 2.4 – 2: Comparison of Effects by Issue

Resource at Issue	Alternative A	Alternative B	Alternative C	Alternative D
Wildlife habitats open to development (acres/%)				
- California condor	0/0%	7,364/100%	293/4%	0/%
- Mexican spotted owl	0/0%	17776/100%	17776/100%	1648/9%
- Utah prairie dog	0/0%	395/4%	395/4%	0/0%
- Yellow-billed cuckoo	0/0%	2667/0.4%	2667/0.4%	0/0%
Forest Service sensitive species	0/0%	Range from about 38,000 to 516,000 acres depending on species. For all species 100% of suitable habitat would be open to exploration and development	Range from about 36,000 to 277,000 acres depending on species. Range from 22% to 87% depending on species.	Range from 0 acres to about 18,000 acres depending on species. Range from 0% to 13.5% depending on species.
Road density in sage grouse and big game habitat	No change	In big game winter range, increase from 1.34 mi/mi2 to 1.40 mi/mi2. Increase of 4%. In big game calving and fawning habitat road density increase from 1.14 mi/mi2 to 1.83 mi/mi2, an increase of 61%.	In big game winter range, increase from 1.34 mi/mi2 to 1.40 mi/mi2. Increase of 4%. In big game calving and fawning habitat road density increase from 1.14 mi/mi2 to 1.83 mi/mi2, an increase of 61%.	No Change
Fragmentation	No change	Some fragmentation	No fragmentation impacts	No fragmentation impacts
ESA effects determination	See table 2.4-3	See table 2.4-3	See table 2.4-3	See table 2.4-3
Sensitive species viability	See table 2.4-4	See table 2.4-4	See table 2.4-4	See table 2.4-4
Compliance with UDWR plans and objectives	Yes	Yes	Yes	Yes
Unroaded/ Undeveloped Areas				
Number of acres in UUA available for lease	0	295,925	110,061	18,296

Resource at Issue	Alternative A	Alternative B	Alternative C	Alternative D
Visual and Scenic Integrity				
Potential visual change	Present viewsheds and their determined Scenic Integrity Objectives would not be altered.	Due to the relatively large number of potentially affected acres classified under these High and Moderate SIOs, there is a good chance that oil and gas leasing activity would impact high quality scenic resources	Similar to alternative B, at a reduced scale. Moderate chance that leasing activity would impact highly scenic resources until mitigation is complete. This is especially the case given the large amount of visually sensitive acres under NSO stipulation in this alternative.	Alternative D has the least potential for negative effect to scenic resources of all of the action alternatives. It is determined that only a negligible 4% total acres could potentially be directly impacted visually -- all of Moderate SIO.
Duration of changes	NA	Disturbance would be short-term and last until mitigation is completed	Disturbance would be short-term and last until mitigation is completed	Disturbance would be short-term and last until mitigation is completed
Geologic Hazards and Steep Slopes				
Potential soil loss (tons/acre/year)	0	5.17 Year 1 3.20 Year 2 2.77 Year 3	5.17 Year 1 3.20 Year 2 2.77 Year 3	5.17 Year 1 3.20 Year 2 2.77 Year 3
Miles of road/acres of disturbance on steep slopes or unstable soils	0	Potentially 20.6 miles of roads and 1421 acres of disturbance	Potentially 20.6 miles of roads and 1421 acres of disturbance	Potentially 20.6 miles of roads and 1421 acres of disturbance
Water Resources				
Level of contamination risk to DWSPZs	No risk	Contamination to ground water supplies is mitigated	Additional mitigation in Alternative C protects culinary water in SWPZ through NSO	Additional mitigation in Alternative D protects culinary water in SWPZ through a No Lease stip
Acres of potential well development within 300 feet of surface water	None	Some risk of disturbance within 300 feet of water sources	None	None
Fisheries				
Increase in sediment level	None	May increase	Likely none	None
Changes to instream habitat structure	None	Could alter riparian habitat affecting instream habitat conditions	None	None
Vegetation				
Acres of potential ground disturbance	0	1421	1421	0
Development potential in habitat for	None	Moderate to High	Low	None

RESOURCE AT ISSUE	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C	ALTERNATIVE D
species of concern				
ESA effects determination	No effect	May affect, not likely to adversely affect	No effect	No effect
Sensitive species impact determination	No impact	May impact, not likely to trend towards federal listing	No impact - Aster kingii var. barnebyana, Cymopterus beckii, Epilobium nevadense, Gilia caespitosa, Najas caespitosa, Salix arizonica, Senecio castoreus, Thelesperma subnudum var. alpinum May impact - Astragalus consobrinus, Astragalus henrimontanensis, Astragalus perianus, Botrychium paradoxum, Castilleja aquariensis, Castilleja parvula var. parvula, Draba sobolifera, Eriogonum batemanii var. ostlundii, Penstemon parvus, Penstemon wardii, Potentilla angelliae, Tonsendia jonesii var. lutea, Erigeron Maguirei	No impact
Air Quality				
Change in air quality above ambient conditions	None	Slight short-term decrease	Slight short-term decrease	Slight short-term decrease
NAAQS exceedances	None	Compliance with all increments for Class I areas within a distance of about 6 to 9 miles and all Class II areas within about 1.6 to 3.1 miles when the receptors are lower than the source	Compliance with all increments for Class I areas within a distance of about 6 to 9 miles and all Class II areas within about 1.6 to 3.1 miles when the receptors are lower than the source	Compliance with all increments for Class I areas within about 6 to 9 miles and all Class II areas within about 1.6 to 3.1 miles when the receptors are lower than the source
Change in visibility compared to natural background	None	Below State guidelines	Below State guidelines	Below State guidelines
Increase in greenhouse gas emissions - Carbon Dioxide Equivalent (CO_2e)	0	365,336	365,336	365,336

RESOURCE AT ISSUE	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C	ALTERNATIVE D
Social/Economic				
Acres and percent of land available for leasing	0/0%	1,707,810/100%	1,707,810/100%	474,726/27.8%
Potential production royalties	None	$8,760,000 annually	$8,760,000 annually	$4,355,000 annually
Potential federal receipts paid to State	None	$4,380,000 annually	$4,380,000 annually	$2,190,000 annually
Potential receipts paid to counties	None	$1,752,000 annually	$1,752,000 annually	$876,000 annually

Table 2.4-3 Summary of effects for federally listed threatened, endangered, and proposed wildlife

SPECIES	ALTERNATIVE			
	A	B	C	D
California condor (endangered)	NE	MA-LAA	MA-LAA	NE
California condor (nonessential experimental)	NE	MA-NLAA	MA-NLAA	NE
Mexican spotted owl	NE	MA-LAA	MA-LAA	NE
Utah prairie dog	NE	MA-LAA	MA-LAA	NE

NE = No Effect MA-NLAA = May Affect - Not Likely to Adversely Affect MA-LAA = May Affect - Likely to Adversely Affect

Table 2.4-4 Determination of impact on the affected Sensitive wildlife species

WILDLIFE SPECIES	ALTERNATIVE			
	A	B	C	D
Bald Eagle	NI	MI-NL	MI-NL	MI-NL
Peregrine Falcon	NI	MI-NL	MI-NL	MI-NL
Spotted Bat	NI	NI	NI	NI
Townsends Big-eared Bat	NI	NI	NI	NI
Northern Goshawk	NI	MI-NL	MI-NL	MI-NL
Flammulated Owl	NI	MI-NL	MI-NL	MI-NL
Three-toed Woodpecker	NI	MI-NL	MI-NL	MI-NL
Greater Sage-grouse	NI	LTFL	MI-NL	NI
Yellow-billed Cuckoo	NI	MI-NL	MI-NL	NI
Pygmy Rabbit	NI	MI-NL	MI-NL	NI
Bighorn Sheep	NI	MI-NL	MI-NL	NI
Boreal Toad	NI	MI-NL	MI-NL	NI
Bonneville Cutthroat Trout	NI	MI-NL	MI-NL	NI
Colorado River Cutthroat Trout	NI	MI-NL	MI-NL	NI
Southern Leatherside Chub	NI	MI-NL	MI-NL	NI
NI = No impacts				
MI-NL = May impact individuals but is not likely to cause a trend to federal listing or loss of viability				
LTFL = Likely to result in a trend to federal listing or loss of viability				

2.5 AGENCY PREFERRED ALTERNATIVE

The Forest Supervisors for the Fishlake and Dixie National Forests have identified Alternative C as the agency preferred alternative. The impacts of the connected actions under Alternative C are summarized and compared to the impacts of the other alternatives in the previous section (Section 2.4). A complete discussion of the impacts under Alternative C is in Chapter 3.

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 INTRODUCTION

This Chapter summarizes the physical, biological, social, and economic environments of the project area, and the effects of implementing each alternative on that environment. It also presents the scientific and analytical basis for the comparison of alternatives presented in the alternatives chapter.

The environmental consequences are identified for each issue under specific resource headings. In addition to addressing the affected environment related directly to issues, this section discusses the types of disturbance that are reasonably foreseeable if leasing occurs and the associated area of potential surface disturbance. This presents a basic understanding of the physical changes that could occur to the environment for each alternative. The environmental consequences section forms the scientific and analytic basis for the comparison of alternatives presented in Chapter 2. NEPA regulations recognize three categories of effects.

Direct effects are caused by an action and occur at the same time and place.
Indirect effects are caused by an action, but occur at a later time or different place
Cumulative effects result from the incremental impact of an action when added to other past, present, and reasonably foreseeable actions, regardless of what agency or person undertakes the other actions (40 CFR 1508.7 and 8).

The direct and indirect effects are based on the Reasonably Foreseeable Development Scenario. The cumulative effects include the effects of oil and gas activities in combination with the effects of other past, present, and reasonably foreseeable activities.
NEPA regulations also state that the Forest Service must show any irreversible or irretrievable commitments or resources that may result from the alternatives.
Irreversible commitment is a permanent resource loss including the loss of future options. It usually applies to nonrenewable resources, such as minerals, or to factors that are renewable only over long periods, such as soil productivity.

Irretrievable commitment is the loss of use or production of a natural resource for some time. One example is suited timberland being used for a road. Timber growth on the land is irretrievably lost while the land is a road, but the timber resource is not irreversibly lost because the land could grow trees again in the future.

3.2 GEOLOGY AND GEOPHYSICAL SETTING

The FNF covers parts of Beaver, Garfield, Iron, Juab, Millard, Piute, Sanpete, Sevier, and Wayne Counties in central Utah. The Forest consists mainly of north-south trending mountains and plateaus bounded by adjacent valleys and basins. The valleys and basins host rural population centers and agricultural lands. Sedimentary rocks, Pre-Cambrian-aged and younger, are exposed on lands managed by the Fishlake National Forest. Thick accumulations of volcanic rocks (igneous rock deposited from volcanic eruptions) of the Marysvale Volcanic Field (Hintze 1988) cover most of the mountain highlands including the Tushar Mountains, Sevier Plateau, southern portion of the Fishlake Plateau, and the top of Boulder Mountain on the Aquarius Plateau. Volcanic formations of the Marysvale Volcanic Field include intermediate to rhyolitic in composition lava flows, debris flows, and ash flow tuffs.

The FNF spans three of Utah's five physiographic provinces. They are, from west to east, the Basin and Range, the Transition Zone (Basin and Range / Colorado Plateau Transition Zone), and the Colorado Plateau. The Basin and Range is underlain by rocks deposited in a trench at the former edge of the continent. These rocks are mainly limestone, dolomite and sandstone. Since these rocks were deposited beneath the ocean, their colors are grays, tans, and blacks. Periods of east-west extensional tectonics produced north-south trending faults, resulting in large down-dropped fault blocks that are the locations of the valleys or basins, while other blocks remained higher forming the mountain ranges. The Basin and Range Province encompasses an area from the Wasatch Range of central Utah to the Sierra Nevada of eastern California.

The Colorado Plateau is a tectonically stable geologic area characterized by rocks deposited in a shallow marine environment or on a coastal plain. These formations are predominantly sandstones, shales, and salts. Tectonic forces have folded these into structures such as the San Rafael Swell and Water Pocket Fold. Most of the Colorado Plateau is drained by the Colorado River System.

The Transition Zone exhibits characteristics of both the Basin and Range Province to the west and the Colorado Plateau to the east. This area is underlain by sedimentary formations typical of the Colorado Plateau; however, they are broken into fault blocks typical of the Basin and Range. The Fillmore Ranger District straddles the border between the Basin and Range Physiographic Province and the Transition Zone, while the Beaver and Richfield Ranger Districts are located totally within the Transition Zone. The Fremont River Ranger District straddles the Transition Zone and Colorado Plateau Physiographic Province. More detailed information for each Fishlake ranger district follows.

3.2.1 Fillmore Ranger District

The Fillmore Ranger District covers the Canyon Mountains and the Pahvant Range. The Pahvant Range runs from Clear Creek Canyon at the south to Scipio Pass on the north. From there, the Canyon Mountains extend northward to the Sevier River at Leamington Canyon, the lowest point in the FNF. The Pahvant Range has a thrust fault that brings older rock from the west over younger rock on the east side of the range. The eastern front of an ancient mountain range runs down the center of the Pahvant Range of today. West of this front, the rocks are limestones, quartzites, sandstones, and shales that were deposited below sea level in a gradually deepening ocean basin called a geosyncline. Compressive forces of continental collision thrust huge sheets of this sedimentary sequence up and over other sheets to form high mountain ranges. East of this front, the rocks are conglomerates, sandstones, and shales shed off these ancient mountains and deposited at their base. Because this debris was deposited on land, much of it is colored red and yellow, in contrast to the drab grays and tans of the marine deposits on the west side of the Pahvant Range.

The rocks on the west side of the range are contorted and stand vertically in many places due to over-thrusting. On the east side, the rocks are flat or dip slightly to the east, due to subsequent

uplift. The Paleozoic rocks, on the west side form numerous high cliffs and steep slopes while the Tertiary rocks to the east are generally more rounded. Shortly after the deposition of these Tertiary rocks, the Pahvants were uplifted along block faults to form the existing range and to start the present period of erosion.
The Canyon Mountains were formed from the same material and in the same manner as the Pahvant Range. The main difference is the bulk of these mountains are composed of the overthrust Paleozoic sequence.

3.2.2 Beaver Ranger District

The Beaver Ranger District includes the Tushar Mountains, the remnants of Tertiary-age volcanoes that deposited a thick section of volcanic rock. Intermediate in composition, the Bullion Canyon Volcanic Formation was deposited from erupting strato-volcanoes 22 to 35 million years ago. Local thicknesses of the Bullion Canyon Volcanics range from 100 to 200 meters at the eroded edges of the stratigraphic section to more than 1 kilometer thick near the center of the volcanic area.

About 21 million years ago, the chemical composition of the volcanic rocks changed from intermediate to rhyolitic in an assemblage known as the Mount Belknap Volcanics. About 19 million years ago, eruptions of rhyolitic ash flow tuffs led to the deposition of the Joe Lott Tuff Member and the collapse of the Mount Belknap caldera. Much of this eruption was deposited north from the volcanic center. The eroded remnants of this tuff extend as far north as Richfield across the southeast corner of the Pahvant Range.

Erosion by water, wind, and glaciers over the past 15 million years has removed the distinctive volcanic shape from this mountain range. The distinctive yellow color of Big Rock Candy Mountain is the result of late stage hydrothermal alteration related to the waning volcanic activity. Acidic sulfur-laden circulating ground waters altered the volcanic bedrock producing clays and various iron oxide mineral suites. Similar deposits are found at Cove Fort and Sulphurdale at the northeast corner of the Tushar Mountains. The active Cove-Fort-Sulphurdale Geothermal Area is a remnant of the area’s volcanic activity.

3.2.3 Richfield Ranger District

The Richfield Ranger District includes the northern end of the Sevier Plateau, southern end of the Wasatch Plateau (north of I-70) and the contiguous northern portion of the Fishlake Plateau (south of I-70).

The geologic formations comprising Monroe Mountain, on the northern end of the Sevier Plateau, are different from the formations of the Colorado Plateau area to the east. This mountain has been racked by violent volcanic eruptions, earthquakes, and giant landslides. There are two main volcanic centers; one is located at Signal Peak and the other at Langdon Mountain. As volcanic eruptions proceeded, the overlying rocks collapsed into the emptied magma chamber creating a deep depression or caldera. One such caldera, the Monroe Peak Caldera measures about 14 miles east to west and 11 miles north to south.

Erosion has reduced the topography to an area of low relief depositing sediments of the Sevier River Formation. Monroe Mountain was then subsequently uplifted and broken into faulted blocks. On the east side of Monroe Mountain, the rocks dip to the east, broken by several faults that drop the east side downward. The west side, however, is bounded by a larger and more fully developed fault system. Stretching from about the town of Gunnison to the Grand Canyon in Arizona, this fault system has significantly dropped the west side relative to the east side. In places there is about two miles of displacement between the two sides. The resulting steep mountain slopes are unstable forming some of the larger known landslides in the state of Utah.

Also in the Richfield Ranger District, Salina Canyon separates the Wasatch Plateau to the north and the Fishlake Plateau to the south. Here Cretaceous aged sediments were deposited in an ancient sea and later covered by coastal plain deposits. In the Cretaceous Period, the Salina Canyon area was swampy with islands of vegetation. Sand and mud bars accumulated alongside a mighty river that emptied into the sea. Dense jungles grew and deposited organic material so rapidly there was not time for decomposition of the vegetation. These materials turned into peat and then into the thick coal seams that today give evidence to the tremendous volumes of organic material that were buried. As the Cretaceous sea level fluctuated, beaches advanced or retreated over the future coal beds burying them. Sediment forming these beaches was delivered by the mighty rivers coming from the mountains to the east. More recently, tectonic uplifts and stream erosion resulted in formation of this canyon.

The Fishlake Basin is located on the southern end of the Fishlake Plateau. The area is capped by volcanic formations erupted from the volcanoes that once existed in this area. The basin formed in a graben when an elongate geologic block dropped between two normal faults. This basin is bounded by Mytoge Mountain on the southeast and Fish Lake Hightop Plateau on the northwest side. This graben extends from near Johnson Valley Reservoir to Windy Ridge, a length of about 10 miles.

3.2.4 Fremont River Ranger District

The Fremont River Ranger District includes the southern portion of the Fishlake Plateau, contiguous with the Richfield Ranger District. The northern portion of the Aquarius Plateau, known as Boulder Mountain, on the Dixie National Forest is now managed by the Fremont River Ranger District.

Thousand Lake Mountain rises on the east side. Here horizontal sedimentary rocks are capped by volcanic formations that erupted out onto the existing rock surface. Because the lavas were not very viscous, they formed a predominately flat surface. Mesozoic age sedimentary formations, range from the Moenkopi Formation found on the south side of this mountain to the Mancos Shale found to the north, lie beneath a cap of basalt and other volcanic rocks. In general however, these sedimentary rocks are buried beneath recent landslide deposits that have slid down the mountain.

As with Monroe Mountain, the high relief of Thousand Lake Mountain is caused by tectonic uplift along a prominent, north-south trending fault that runs along the west side of the mountain. Movement along this fault has made Thousand Lake Mountain stand higher than the valley to the west. Bending of the rocks on the east side of the mountain has made it higher than the valleys to the east. The block faulting of sedimentary strata, capped by volcanic flows are characteristic of the Transition Zone Province, Basin and Range tectonics acting upon Colorado Plateau strata.

South of Thousand Lake Mountain is Boulder Mountain, separated by the Fremont River. It forms the northeast end of the Aquarius Plateau which is the highest of Utah's high plateaus. Like other dominant topographic features, this area was uplifted and subsequently shaped by, volcanic activity, glaciation and erosion. Similar to Monroe Mountain to the northwest and Thousand Lake Mountain to the north, Tertiary volcanic rock were deposited upon Mesozoic age strata capping the top of Boulder Mountain with a resistant unit and forming a nearly level tableland.

As on Thousand Lake Mountain, landslides and landslide deposits are common along the slopes below the rim. Unstable conditions have been caused by water infiltration through the fractured volcanic rocks and emerging along the lower slopes in sedimentary rock. Saturation of the slopes has caused lubrication, increased weight, and has contributed to the rapid weathering of shales to slippery clays. Lubrication and loading of unconsolidated Quaternary colluvium consisting of glacial deposits, clays, and talus has caused numerous landslides. Rock glaciers are common as lobes on all sides of Boulder top near the base of the summit cliff, at altitudes of about 10,500 to 10,700 feet (Flint 1958). Rock glaciers consist of thick masses of angular volcanic boulders that move slowly down the steep slopes similar to the movement of snow glaciers.

Numerous small lakes occur along the intermediate slopes or bench between the steep summit cliff and the down canyon slopes. Glacial valleys cut into this bench in a radial pattern around Boulder top draining the mountain to the adjacent lowlands.

3.3 EFFECTS OF THE ALTERNATIVES ON THE REASONABLY FORESEEABLE DEVELOPMENT SCENARIO

The predicted areas and types of surface disturbance related to post-lease oil and gas activities are estimates based on the RFDS. Table 3.1-1 displays the scenarios by alternative.

The table displays the total, or gross surface disturbance for all facilities, and the net disturbance for long-term production facilities, after road cut and fill slopes, production pads and pipelines are revegetated. For example, a wildcat well would disturb a total area of approximately 275 feet by 400 feet for a total surface disturbance of approximately 2.5 acres. If the well does not result in a discovery and does not become productive, it would be reclaimed immediately after testing and plugging or by the following field season. The entire pad and project access road would be returned to approximate original contour, topsoil would be replaced, and the area would be seeded and fenced to prevent use until vegetation standards are met.

If a wildcat well results in a discovery and is converted to a production well, the pad would be reduced to the minimum area needed to accommodate production facilities, usually about two-thirds of the original size. The well pad and access road would be retained during oil and gas production and then reclaimed as discussed above. The net surface disturbance would include the disturbed area for the road and that portion of the pad needed long-term for production. If additional disturbance is needed for production facilities other than the pad and road, that disturbance would be included as part of the net disturbance. Overall the net disturbance considering all wildcat wells not put into production and project roads would be less than the gross disturbance. The following table displays the anticipated totals.

Land that would be designated as NL or NSO under Alternative D was compared to the Oil and Gas Occurrence Potential, and Oil and Gas Development Potential maps contained in the RFDS report. It was determined that the land that would be available for lease under Alternative D falls largely under moderate and high occurrence and development potential. Therefore, analysis assumes full development as predicted in the RFDS for all alternatives. The difference would be that exploration and development could be more concentrated under Alternative D, and more spread out under Alternatives B and C.

Table 3.3-1: Surface Disturbance for Oil and Gas Exploration/Development by Alternative

Oil and Gas Activity	Alternative A	Alternative B	Alternative C	Alternative D
SEISMIC/GEOPHYSICAL SURVEYS				
Seismic Surveys	0 miles 0 acres	650 miles 395 acres	650 Miles 395 acres	650 miles 395 acres
OIL AND GAS EXPLORATION				
Pads	None	43 pads 254 acres	43 pads 254 acres	43 pads 254 acres
Project Road Construction	None	32.2 miles 198 acres	32.2. miles 198 acres	32.2 miles 198 acres
Reconstruction of National Forest System Roads	None	111.4 miles 189 acres	111.4 miles 189 acres	111.4 miles 189 acres
OIL FIELD DISCOVERY AND DEVELOPMENT				
Pads	None	30 wells 25 pads 160 acres	30 wells 25 pads 160 acres	30 wells 25 pads 160 acres
Project Road Construction	None	16.8 miles 104 acres	16.8 miles 104 acres	16.8 miles 104 acres
Pipelines and Powerlines	None	10 miles 112 acres	10 miles 112 acres	10 miles 112 acres
TOTAL SURFACE DISTURBANCE				
Gross Disturbance	None	1,412 acres 52.8 miles new road	1,412 acres 52.8 miles new road	1,412 acres 52.8 miles new road
Net Disturbance After reclamation	None	350 acres 20.6 miles of new road remaining long-term for production	350 acres 20.6 miles of new road remaining long-term for production	350 acres 20.6 miles of new road remaining long-term for production

Note: Land that would be designated as NL or NSO under Alternative D was compared to the Oil and Gas Occurrence Potential, and Oil and Gas Development Potential maps contained in the RFDS report. It was determined that the land that would be available for lease under Alternative D falls largely under moderate and high occurrence and development potential. Therefore, analysis assumes full development as predicted in the RFDS for all alternatives.

Table 3.3-2: Estimated Traffic Types and Volumes for Activities*

Activity	Light Trucks (Round Trips)	Heavy Trucks (Round Trips)
EXPLORATION WELLS (Total Traffic Volumes/Well)		
Area Reconnaissance and Survey - Planning Pad/wells	15	-
Mobilize Construction Equipment	2	5
Road and Pad Construction		
Equipment Mobilization	-	8
Personnel/Supplies	25	
Gravel Hauling	-	288
Drill Rig Mobilization		
Rig Components (Move-in)	-	30
(Move out)	-	30
Personnel/Supplies	25	-
Exploration Drilling		
Water Trucks	-	300
Waste Disposal	-	50
Drill Mud/Materials	-	10 – 20
Well Casing	-	10
Cement/Fly Ash	-	4 - 9
Misc. Equipment	-	10
Personnel/Supplies	100	-
Well Plugging and Abandonment/Reclamation of Pad and Road (No Discovery)		
Cement and Water	-	15
Construction Equipment	-	5
Remove/Haul Reserve Pit Fluids for Disposal	-	10
Personnel/Supplies	20	-
DISCOVERY/PRODUCTION WELLS (Total Traffic Volumes/Well)		
Well Completion/Completion Rig		
Rig Mobilization (Move-in)	-	4
(Move-out)	-	4
Casing/Perforation/Cementing, Fracturing	-	30
Water Trucks	-	50
Personnel/Supplies	15	-
PRODUCTION WELL PADS (Total Traffic Volumes/Pad)		
Production Construction/Development		
Haul in Facilities (Wellhead/pumps, tanks, pipeline	-	10
manifolds, etc.)	-	-
Personnel/Supplies	25	
CENTRAL PRODUCTION FACILITIES/ANCILLARY FACILITIES (Total Traffic Volumes/Field) 2 Fields Predicted		
Construction		
Construction Equipment Mobilization	-	8-20
Gravel Hauling to Pad	-	300
Personnel/Supplies	50	-
Buildings/Facilities (Compressors, Generators, Pipeline Manifolds, Heater-Treaters, etc.)	None or very minimal effects from these projects remain after one year	
Hauling to pad		10-100
Personnel/Supplies		-
Pipeline, Powerlines, Oil Loading Pad		
Haul in Equipment (excavators, pipe, welders, etc.)	-	50
Personnel/Supplies	100	-
FIELD OPERATIONS/PRODUCTION (Average Traffic Volumes/Day)		
Operations		
Haul oil to market/refinery	-	10
Dispose of water/distillates/gas	-	0-1
Workover rigs	0.1	0.1
Maintenance/Repairs	0.2	0-0.1
Personnel/Supplies	3	-
Other	0.1	0-0.1

ACTIVITY	LIGHT TRUCKS (ROUND TRIPS)	HEAVY TRUCKS (ROUND TRIPS)
FIELD/WELL ABANDONMENT/REMOVAL (TOTAL TRAFFIC VOLUME/FIELD)		
Plug and Abandon Production Wells Remove downhole pumps, monitors, etc. Mobilize Plugging Rig (Move-in) (Move-out) Plug/Cement (haul cement, plugging mud, water, etc.)	 20 - - -	 Combined with rig mobilization 40 40 50-100
Mobilize Construction Equipment	-	8
Remove Buildings, Facilities, and Contaminated Gravel and Soils	-	25-50
Personnel/Supplies	100	-
RECLAIM SURFACE DISTURBANCE (TOTAL TRAFFIC VOLUME/FIELD)		
Mobilize Construction Equipment	-	25
Contour Disturbed Area (approximate original contour, replace topsoil, and seed/mulch)	-	15
Fence Reclaimed Pads	-	3
Personnel/Supplies	30-50	-

*Based mostly on UDOT U.S. 40 Corridor Predicted Traffic Volumes and personnel communications with Wolverine Gas and Oil Co. Gravel hauling estimated by Forest Service based on required average aggregate depth requirements, pad sizes, and road distances.

3.4 PAST, PRESENT AND REASONABLY FORESEEABLE FUTURE ACTIONS

Table 3.4-1 presents the current and reasonably foreseeable future actions that could cause effects considered cumulative to the potential effects of oil and gas leasing. Specialists preparing their technical reports considered these actions within the alternatives and provided their resulting analyses based upon these actions.

Table 3.4-1 Past, Present and Reasonably Foreseeable Future Actions

Project Name	Unit	Acres	Decision Date	Date Completed	Brief Project Description	Current Residual Effects and Duration
Special Use Permit - ATV Jamboree	Fishlake NF	N/A	2000	Yearly	Two annual Jamborees	None
Forest Plan Amendment for Management Indicator Species	Fishlake NF	N/A	2/6/2006	N/A	Amend the Forest Plan in order to designate specific member species of the cavity nester, sage nester and riparian guilds as MIS	No current or residual effects
Sigurd to Red Butte Powerline	Fishlake NF	557	12/7/2012	2014	Authorization & Installation of 345 kV powerline	No long term, significant effects
Beaver District Slash Disposal	Beaver	180	N/A	Ongoing	These are various slash pile locations throughout the district	Burn piles to reduce fuels in small concentrated plots. Seeding on selected sites, but natural regen will be apparent and return to a natural condition in 2-3 years
Circleville Timber Sales	Beaver	120	2005	Completed	Timber sales implemented for spruce beetle suppression. Planting will occur in 2009, and burning of slash piles will occur in 2008, seeding will occur on those sites.	Sale activity concluded in summer of 2007. KV projects will be implemented in the next 5 years. Spruce beetle suppression may occur in the next 5 years if found
Deer Trail Wildlife	Beaver	800	2001	Completed	Cutting of PJ in chained areas, burning, and seeding for wildlife	Increased wildlife and forage habitat
Twitchell Salvage	Beaver	1240	7/29/2013	2018	Removal of timber burned in a wildfire	No long term, significant effects

PROJECT NAME	UNIT	ACRES	DECISION DATE	DATE COMPLETED	BRIEF PROJECT DESCRIPTION	CURRENT RESIDUAL EFFECTS AND DURATION
I-70 Wireless Communication Sites	Beaver	2	2006	Completed	Construction of 2 communication sites for wireless communications along I-70 (near Fremont Indian State Park and Cove Fort)	Communication sites for the long term to facilitate cellular telephone communications. Fuels reduction along the power lines and communication sites
Kent's Lake Non-native Shiner Control (DN-FONSI)	Beaver	Kents Lake	9/22/04	10/04	Allow Utah DWR to conduct treatment of Middle and Lower Kent's Lakes to eliminate non-native golden shiners	Shiners were eliminated from the lake. Desirable species were restored. No lasting effects
Shingle, Fish, and Pole Creeks	Beaver and Fillmore	Streams	State Actions, no NEPA	Shingle 2010 treatment deferred. Treatments beginning in 2011.	Renovation treatment to remove l non-native fish and restore native Bonneville Cutthroat Trout	No lasting effects from chemical. Requires temporary or permanent fish barriers on streams (Shingle constructed 2009, Pole Creek proposed 2011).
Shingle, Pole and Clear Creek Fish Barriers	Beaver and Fillmore	Streams	2009	Shingle constructed 2009. Pole Creek planned for 2011	Rock fish barriers	Short term effects during construction. Improvement of fish habitat for native species.
North Creek	Beaver	Streams	State Actions, no NEPA	Likely deferred until some habitat recovery from Twitchell Canyon fire	Renovation treatment to remove non-native fish and restore native Bonneville cutthroat trout	No lasting effects from chemical

PROJECT NAME	UNIT	ACRES	DECISION DATE	DATE COMPLETED	BRIEF PROJECT DESCRIPTION	CURRENT RESIDUAL EFFECTS AND DURATION
Little Reservoir Fuel Reduction	Beaver	144	12/7/04	Completed	Mechanically treat fuels within 400' wide buffer on portions of west, north, and east boundary of private land subdivisions adjacent to Little Reservoir	Fuels reduction along private lands for defensible space if wildfire occurs. Will need to be maintained over long periods in the out-decades
Shingle , Pole ak Fuels Reduction	Beaver	1,900	2005	Completed	Mechanically treated and burned Pinyon and Juniper to restore shrub-steppe conditions and reduce fuel loading	Grazed in summer of 2007. Effects of fire are reduced and native and past seeded grasses are showing increases due to the crown closure being opened up
Small Sales	Beaver	50	2/1/2005 8/29/2003	Ongoing	Post, pole, firewood and Christmas Tree sales	Ongoing and will continue over the foreseeable future. Fuel reduction is the main benefit and effect
South Fork Vegetation Treatment	Beaver	1959	7/7/06	Ongoing	Five timber sales to suppress spruce beetle outbreaks and fuels reduction adjacent to private lands	Activity will be ongoing for next 5 years, slash disposal, KV, tree planting. Follow up beetle suppression may occur up to 5 years past the sale dates

Project Name	Unit	Acres	Decision Date	Date Completed	Brief Project Description	Current Residual Effects and Duration
Tushar Grazing	Beaver	185,000	1/16/07	Ongoing	8 grazing allotments	Livestock grazing will continue in these allotments, coupled with annual operating instructions that will provide rest/rotation on the various pastures
Water System Upgrade for Mahogany Cove, Little Reservoir and Little Cottonwood Campgrounds	Beaver	3 camp-grounds	5/23/03	Completed	Upgrade water system to 3 campgrounds	Water systems are in place providing clean drinking water for the next 10-20 years
Wolverine Oil and Gas Seismic Exploration	Beaver Richfield	9.7 miles 107 miles	7/6/2005 2010	11/1/06 Completed 2010	Seismic survey using buggy &heliportable drills and shot-hole detonation. There were short-term impacts associated with the activity, noise and some surface disturbance. Based on follow-up inspections, companies did a good job of "leaving no trace." The activities did not permanently change the primary issue indicators assigned to track cumulative resource impacts for the route designation project.	None or very minimal effects from these projects remain after one year
Pine Creek	Beaver	1500	2002	Ongoing	750 acres prescribed fire, 750 acres mechanical treatment	Other project acres in this area are scheduled for further cutting and burning
Willow Springs	Beaver	1000	2002	Completed	500 acres prescribed fire, 500 acres mechanical treatment	Other project acres in this area are scheduled for further cutting and

PROJECT NAME	UNIT	ACRES	DECISION DATE	DATE COMPLETED	BRIEF PROJECT DESCRIPTION	CURRENT RESIDUAL EFFECTS AND DURATION
						burning
Cove Fort-Sulphurdale Geothermal Leasing	Beaver and Fillmore	6,097	3/14/06	Ongoing	Three geothermal lease parcels are on NF lands for geothermal energy development	Lease sale completed in June, 2007. A Magneto-telluric geophysical survey is ongoing and expected to conclude in 2008 with no effects. Long term expectations are for additional geothermal wells to be developed within the leasehold, with ancillary pipelines to be installed. 7 APDs have been approved. One well has been drilled. An Aero-Magnetic survey from a light aircraft will take place. No effects are expected
Grant Geophysical Exploration	Beaver and Fillmore	16 miles	11/4/05	Completed	Geophysical survey	None or very minimal effects remain after one year
Abandon Mine Closure	Fillmore	5	10/27/03	09/30/04	Close 31 mine sites & openings. Closures will be by backfilling or bat gates	None

PROJECT NAME	UNIT	ACRES	DECISION DATE	DATE COMPLETED	BRIEF PROJECT DESCRIPTION	CURRENT RESIDUAL EFFECTS AND DURATION
Church Hills Prescribed Burn	Fillmore	3,460	2001	Completed 2001	Prescribed fire in a mosaic of 30 - 50% burned in areas of previous chaining	None or very minimal effects remain
Cove Fort Wildlife	Fillmore	400	1996	1997	Mx and Rx	Approximately 13 years of recovery are in place
Kanosh Canyon & Big Springs Campground Toilet Replacement	Fillmore	5	10/22/03	09/30/04	Replace existing deteriorated restrooms at 2 campground facilities	Area has recovered. Impacts to resources were minimal
Maple Hollow Road / Campground Reconstruction	Fillmore	1/2 mile; 1 ac.	12/1/02	09/30/03	Reroute 1/2 mile of road, repair damaged road, upgrade campground facilities	Area has recovered
Pahvant Horse Hollow Fuels	Fillmore	649	Planning	Planning	Prescribed fire for hazardous fuels reduction	Project has not been implemented yet
Pahvant Interagency Fuels Reduction Project	Fillmore	14,329	2004	Ongoing	Cut and burn hazardous fuels along west side of Pahvant (Scipio to Meadow). Remove 40 - 80% of vegetation within 7 treatment units to reduce fuel height & load	Fuels projects are ongoing and the area is recovering
Pahvant Pioneer Fuels	Fillmore	310	Planning	Planning	Prescribed fire for hazardous fuels reduction	Project has not been implemented yet
Pahvant Wild Goose Fuels	Fillmore	1373	Planning	Planning	Prescribed fire for hazardous fuels reduction	Project has not been implemented yet.
Scipio Slate Quarry	Fillmore	unknown	7/9/01	Ongoing	Open existing slate quarry for commercial use.	Quarry is confined to mine site.
Small Sales	Fillmore	unknown	unknown	Ongoing	Forest products including fuel wood and post permits	Ongoing sale of individual permits. No commercial sales

PROJECT NAME	UNIT	ACRES	DECISION DATE	DATE COMPLETED	BRIEF PROJECT DESCRIPTION	CURRENT RESIDUAL EFFECTS AND DURATION
Watts Mountain / Elsinore / Grass Creek Bench / East Kanosh / WL / Fuels / Range	Fillmore	5,000	Planning	Ongoing	Fuels reduction project using a Dixie harrow and prescribed fire	Still to be determined
Whiskey Creek Fuels Reduction	Fillmore	250	2000	Ongoing	Hazardous fuels reduction project. Mechanical and prescribed fire	Reduction of fuel loads and improvement of rangeland and wildlife habitat
Kanosh Bench Wildlife	Fillmore	1000	2009	2013	Mechanical treatment	Minimal effects
Bowery Haven RV Park Expansion	Fremont River	1.5	4/6/07	Addition of parking spurs and cabin completed in 2009	Add 9 RV parking spurs, 1 double cabin, laundry, shower and restroom to existing resort facilities	Will be minimized with reclamation. Local disturbance associated with facility construction will be visible for about 20 years
Coleman Reservoir Dam Reconstruction	Fremont River	15	11/29/05	10/31/2006	Reconstruction of the Coleman Reservoir Dam	Though reclamation minimized, localized disturbance associated with access to dam will be visible for about 20 years. As required by State of Utah regulations, deep rooted vegetation will not be allowed on dam

PROJECT NAME	UNIT	ACRES	DECISION DATE	DATE COMPLETED	BRIEF PROJECT DESCRIPTION	CURRENT RESIDUAL EFFECTS AND DURATION
Meeks, Morrell & Round Lake Dam Maintenance	Fremont River	3	8/1/07	2009	Maintenance of dams at 3 lakes/reservoirs	Dams will be maintained free of deep rooted vegetation. Fishery habitat will be stabilized. Localized effects of maintenance will be visible for an indefinite period
Dark Valley Vegetation Management	Fremont River	20	10/7/04	10/31/2007	Commercial thin to reduce vegetation density to protect from insects and catastrophic wildfire. Four units, two have been completed. This project was stopped by the Courts	Only 20 acres were treated so the rest of the project area was unchanged and will remain susceptible to insects and diseases.
Durfey Creek	Fremont River	350	6/25/05	About 2003	Thin to reduce pinion juniper and Dixie harrow/seeding to manage dense brush areas.	Mosaic of open meadows dispersed with PJ will remain on land. Vegetation type change to forbs, shrubs and grasses for about 20 years
Fishlake Basin Fuels Reduction	Fremont River	900	7/1/07	10/31/2008	Reduce fuels by mulching brush, pruning trees, mowing, and removal of dead limbs etc. Project includes work being done by rec. residence permit holders	Hazardous fuels associated with timber stands and sagebrush will be reduced. Treated sagebrush areas will be visible for about five years. Mosaic mowing patterns obscure treated areas

PROJECT NAME	UNIT	ACRES	DECISION DATE	DATE COMPLETED	BRIEF PROJECT DESCRIPTION	CURRENT RESIDUAL EFFECTS AND DURATION
Fishlake Basin Water System Reconstruction	Fremont River	12.2	10/10/03	2008	Reconstruct and upgrade 2 water systems: Twin Creeks, Bowery Creek and Fishlake Lodge system and Doctor Creek and Lakeside Resort system	Disturbed area where pipeline has been buried will be visible for 20 years though re-contouring and re-seeding has occurred. Larger visible rocks will be moved for use as barrier rocks
Garden Basin Fuels	Fremont River	250	Maintenance only	2007	Use thinning to reduce pinion & juniper	Mosaic patterns of open meadows dispersed with PJ will remain on land. This change of vegetation type to forbs, shrubs and grasses will last about 20 years
Lost Spring Aspen Project	Fremont River	123	12/12/05	Complete 2007	Treat aspen to remove diseased trees and encroaching conifers. Stimulate regeneration using commercial harvest and fire in six patches between 5 and 34 acres	Aspen stands will be regenerated. Effects of logging will be evident for 5 to 10 years
Mytoge Vegetation Treatment	Fremont River	150	5/26/05	Ongoing as of 2011	Harvest beetle-infested, diseased, mature and dead timber, using modified group/individual tree selection, salvage and sanitation cutting methods in Douglas fir/sub-alpine fir, and regeneration treatment in aspen.	Aspen and conifer stands will be regenerated. Effects of logging will be evident for 5 to 10 years.
North Slope Fuels	Fremont River	800	6/28/05	2008	Thinning of conifer in open meadows	Mosaic patterns of open meadows dispersed with PJ

Project Name	Unit	Acres	Decision Date	Date Completed	Brief Project Description	Current Residual Effects and Duration
						and mixed conifer will remain on land. This change of vegetation type to forbs, shrubs and grasses will last about 30 years
Oak Creek	Fremont River	1500	about 1998	Completed 2007	Aspen regeneration in sub-alpine fir communities	Change in cover type to aspen would last for an indefinite period of time. Visual effects of prescribed burning will last for 5 to 10 years
Park Ridge Burn	Fremont River	250	about 2000	Ongoing as of 2011	Under-burn in Ponderosa pine stands to reduce fuel loads	Reduction in fuel loads will last for 10 to 12 years. Visual effects of prescribed burning will last for about 10-15 years
Round Lake and Morrell Pond Toilet Replacement Project	Fremont River	1	3/29/04	Completed	Replace existing toilets at Round Lake and Morrell Pond	Localized disturbance associated with toilet installation will be visible for about 5 years. Water quality and fishery habitat will be improved for an indefinite period

PROJECT NAME	UNIT	ACRES	DECISION DATE	DATE COMPLETED	BRIEF PROJECT DESCRIPTION	CURRENT RESIDUAL EFFECTS AND DURATION
UM Creek Riparian Fence	Fremont River	7 miles	6/6/03	10/31/2006	Construct 17 miles of fence (14 miles intermittent let down fence along 7 miles of riparian & 2 - 3 miles of drift fence)	Fishery habitat is enhanced for an indefinite period of time. Visual effects of fence will remain as long as fence remains
UM Creek Waterlines	Fremont River	12 miles	6/1/03	Completed	Install waterline to distribute livestock and wildlife away from riparian areas	Above ground water line is visible. Fewer ungulates on riparian areas
Indian Trail Bench	Fremont River	300	6/1/03	5/1/2008	Prescribed fire to remove pinion & juniper	Removal of pinion & juniper would last for about 50 years. Visual effects of prescribed burning will last for 20 to 30 years
Lyman Bench Rx burn	Fremont River	450	6/1/04	9/30/2004	Use thinning to reduce pinion & juniper and Dixie harrow to manage dense brush areas	Mosaic patterns of open meadows dispersed with PJ will remain on land. This change of vegetation type to forbs, shrubs and grasses will last about 20 years
Lower Brown/Rosebud Campground Construction & Re-construction	Fremont River	15	10/31/05	9/30/2007	Reconstruction of Lower Browns C.G. and construction of Rosebud ATV campground	Adequate developed camping spots available for public. Use of existing dispersed camping sites will decrease

PROJECT NAME	UNIT	ACRES	DECISION DATE	DATE COMPLETED	BRIEF PROJECT DESCRIPTION	CURRENT RESIDUAL EFFECTS AND DURATION
Pollywog/Big Lake UTPD	Fremont River	500	6/21/07	Will be completed in 2011	Prescribed fire and mechanical treatment of sagebrush to reduce canopy cover and improve prairie dog habitat	Improved prairie dog habitat for about 5 years. Newly created mosaic pattern of vegetation will be visible for about 5 years
Sheep Valley Vegetation Improvement	Fremont River	250	6/1/07	Completed 2007	Mechanical treatment of decadent sagebrush	Newly created mosaic pattern of vegetation will be visible for about 5 years
Purple Lake Road Decommission	Fremont River	0.07 mi.	5/1/07	7/31/2007	Obliterate 0.7 mile of road causing sedimentation to adjacent lakes and watershed	Improved water quality for an indefinite period of time. Reduction of motorized public access in the area
Torrey Culinary Water	Fremont River	4	12/13/04	9/31/05	Develop spring and install pipeline to provide culinary water for local community	Construction effects will be visible for about 5 years. No effect on associated wetland or riparian areas
Fishlake Basin Winter Toilets Installations	Fremont River	2	5/1/05	8/1/2005	Installation of 3 vault toilets at Fish Lake	Improved water quality for an indefinite period
Cedar Creek Wildlife	Fremont River	3569	4/09	Ongoing as of 2011	Mechanically treat with bobcat and chainsaw, pile and burn	Improve wildlife winter range and reduced fuels
Boulder Foothills	Fremont River	3834	est 2014	Undergoing analysis	Mechanically treat with bobcat and chainsaw, pile and burn	Improve wildlife winter range and reduced fuels thin timber stand
Steep Creek Aspen	Fremont River	700	5/09	Completed 7/09	RX Fire to enhance aspen regeneration	Aspen regeneration,

PROJECT NAME	UNIT	ACRES	DECISION DATE	DATE COMPLETED	BRIEF PROJECT DESCRIPTION	CURRENT RESIDUAL EFFECTS AND DURATION
						monitoring into next several years
Green's Hollow Coal Lease Tract	Richfield	81	Estimated 2013	In process	Proposed new coal lease to add additional mineable reserves to the SUFCO Mine	Should not have any impact to the operation of the SUFCO mine or this coal lease issuance
Annabella 2 Slash Disposal	Richfield	20	7/20/00	Ongoing	is not complete: three additional units to be treated. These are aspen clear-cuts that require fencing to assure regeneration	Areas treated have limited vegetation remaining and will require up to fifteen years to totally recover
Black Mountain	Richfield	400	5/5/04	12/28/2005	Dixie harrow treatment of sage brush and pinion/juniper in an old chaining area to set back conversion to trees	The areas have completely recovered hydrologically. It will take 10 to 15 years for sagebrush to need re-treatment
Blue Peak	Richfield	602	7/3/03	12/28/2005	Dixie harrow and brush saw treatment of pinion/juniper in old chaining area to set back conversion to trees	The areas have completely recovered hydrologically. It will take 10 to 15 years for sagebrush to need re-treatment
Monroe Mountain Range Improvement	Richfield	Fencing and water develpmnt	4/29/2013	2014	Installation of 1 mile of fence and improved water distribution systems	Improved livestock distribution and vegetation condition

Project Name	Unit	Acres	Decision Date	Date Completed	Brief Project Description	Current Residual Effects and Duration
Box Creek Hazardous Fuels Reduction	Richfield	4294	7/6/2007	Ongoing	Reduce fuel loading and the risk of high-intensity, high severity wildfire, reduce susceptibility of spruce fir stands to insects and diseases, and improve aspen stand health. Includes 494 acres of mechanical, and 3,308 acres of prescribed fire. Treatment areas are located in the Dairies and Brindley Flats units on Monroe Mountain.	Effects from harvest operations will continue at a reduced rate for 10 years. Effects from fire will continue at a reducing rate for ten years.
Browns Hole	Richfield	166	10/2/06	2008	Dixie harrow double pass and broadcast seeding on sagebrush.	Project will require two to three years to fully recover hydrologically. It will take 10 to 15 years after that for sagebrush to need re-treatment
Flat Top Dixie Harrow Project	Richfield	302	10/2/06	2008	Vegetation treatment using a Dixie harrow, double pass and broadcast seeding on sagebrush	Project will require two to three years to fully recover hydrologically. It will take 10 to 15 years after that for sagebrush to need re-treatment

Project Name	Unit	Acres	Decision Date	Date Completed	Brief Project Description	Current Residual Effects and Duration
Henries Hollow Geophysical	Richfield	70+ miles Seismic Survey	6/12/2007	Completed: Fall 2007 to Summer 2008	Survey lines of about 60 miles on NFS land on the Richfield Ranger District. Use of rubber-tired buggy mounted and helicopter-portable drilling equipment to excavate 3½ inch by 40 foot-deep shot holes to carry small explosive charges. Shot holes drilled on about 330-foot intervals. No road construction or improvements required. About 40-60 days to complete drilling and recording	Effects are very small with complete recovery in less than two years. Most impacts are no longer visible after first season
Monument Peak Hazardous Fuels Reduction	Richfield	3520	3/10/10	Ongoing	Reduce fuel loading and the risk of high-intensity, high severity wildfire, reduce susceptibility of spruce fir stands to insects and diseases, and improve aspen stand health. Includes 400 acres of mechanical, and 3120 acres of prescribed fire.	Effects from harvest operations will continue at a reduced rate for 10 years. Effects from fire will continue at a reducing rate for ten years.
North Clover Vegetation Treatment	Richfield	248	3/14/05	Ongoing	Harvest diseased, beetle-infested, mature and dead timber, using modified group selection, salvage harvest methods in spruce, and clear-cut in aspen. 0.5 miles of temporary road constructed.	Effects from harvest operations will continue at a reduced rate for 10 years.

Project Name	Unit	Acres	Decision Date	Date Completed	Brief Project Description	Current Residual Effects and Duration
Quitchupah Road	Richfield	146.3	3/9/07	Road completed 2013	Road upgrade and realign 9.1 miles of the Quitchupah Creek Road. 2.5 miles are on Forest, 7.9 miles on BLM lands, 0.26 miles on SITLA and 0.53 on private land. Road is to facilitate coal hauling from the Sufco mine east to highway 10.	The road will continue to contribute sediment into Quitchupah Creek as displayed by the EIS for a long period of time
Rueben's Fuel Reduction	Richfield	2,316	3/7/05	Completed 2007	Treat hazardous fuels in Tibadore Canyon area with prescribed fire. 60 - 70% of each unit will be burned in a mosaic pattern in late spring or early summer	Effects from fire will continue at a reducing rate for ten years
Salina Creek Dispersed Recreation	Richfield	3/4 mile; 10 ac.	9/1/06	Completed 2006	Close dispersed camping along Salina Creek for 3/4 mile; construct a camping area with limited improvements - 30 trailer pads (<10ac); turnout/parking lot at White Mountain Horse trailhead and Beaver Creek.	Water quality and stream vegetation will improve markedly for ten years when recovery will be complete
Salina Creek Vegetation Management	Richfield	946	2/12/04	Completed 2008	Treat hazardous fuel load with prescribed fire (550 ac.) and mechanical (396 ac.) treatments	Effects from fire and mechanical treatments will continue at a reducing rate for ten years
Niotche Beetle	Richfield	184	3/16/07	Completed 2009	Commercial thin to reduce stand density of Engelmann spruce. Reduce basal area to < 100 sq. ft. Reduce average stand diameter to < 12 inch, reduce spruce canopy to < 50%	Effects from harvest operations will continue at a reduced rate for 10 years

Project Name	Unit	Acres	Decision Date	Date Completed	Brief Project Description	Current Residual Effects and Duration
Seven Mile Spruce Beetle Management	Richfield	123	10/28/04	2008	Commercial thin to reduce stand density of Engelmann spruce. Reduce basal area to < 100 sq. ft. Reduce average stand diameter to < 12 inch, reduce spruce canopy to < 50%	Effects from harvest operations will continue at a reduced rate for 15 years due to heavier harvesting because of insect caused mortality
White Pine Ridge Vegetation Treatment	Richfield	240	5/24/2007	Completed 2010	Commercial thin Engelmann spruce affected by spruce bark beetle	Effects from harvest operations will continue at a reduced rate for 10 years
Clover Flat Aspen	Richfield	22	3/14/05	2008	Aspen clear-cut	Effects will continue at a reducing rate for 20 years
East Bull Springs	Richfield	1150	5/5/04	Ongoing	Dixie harrow and brush saw pinion/juniper in old chaining area to set back conversion to trees. Bull hog retreatment	The areas have completely recovered hydrologically. It will take 10 to 15 years for sagebrush to need re-treatment
Horse Pasture	Richfield	527	NA	2008	Dixie harrow pinion/juniper, sagebrush to set back conversion and increase forage for wildlife and Forest Service horses	The areas will completely recover hydrologically within three years. It will take 10 to 15 years for sagebrush to need re-treatment
Jolly Mill	Richfield	465	8/3/04	10/8/2004	Dixie Harrow	The areas have completely recovered hydrologically. It

Project Name	Unit	Acres	Decision Date	Date Completed	Brief Project Description	Current Residual Effects and Duration
						will take 10 to 15 years for sagebrush to need re-treatment
Moroni Peak	Richfield	4500	3/9/99	Completed 2004	RX burn	Majority of the fire has recovered. Effects will continue at a reducing rate for ten years
Ruebens Seeding	Richfield	2316	3/7/05	Completed	RX burn 948 and seed 567 acres	Majority of the fire has recovered. The seed spread on the fire in 2005 has sprouted and is fully established. Effects will continue at a reducing rate for ten years
Salina Creek Fuels	Richfield	3200	Ongoing	Ongoing	RX burn 2800 acres and mechanical fuels reduction on 400 acres.	Effects from fire and mechanical treatments will continue at a reducing rate for ten years.
Steves Mtn - Resource Benefit	Richfield	15	8/13/05 Start	9/5/2005	Lightning caused - Resource Benefit	Fire is in process of recovery. The seed spread on the fire in 2005 has sprouted and will be established fully at the end of the 2008 season
Razorback - Resource Benefit	Richfield	228	7/25/2004 Start	10/1/2004	Lightning caused - Resource Benefit	Majority of the fire has recovered. Seed spread on the

PROJECT NAME	UNIT	ACRES	DECISION DATE	DATE COMPLETED	BRIEF PROJECT DESCRIPTION	CURRENT RESIDUAL EFFECTS AND DURATION
						fire in 2004 has sprouted and is fully established. Effects will continue at a reducing rate for ten years
South Water Hollow – Resource Benefit	Richfield	14	2010	2010	Lightning caused – Resource Benefit	Fire is in process of recovery.
Tommy Hollow	Richfield	123	5/12/04	10/15/2004	Dixie Harrow and seed	Area has recovered hydrologically. 10 to 15 years for sagebrush to need re-treatment
Triangle	Richfield	275	5//5/2004	Completed	Dixie Harrow and seed in old chaining	Area has recovered hydrologically. 10 to 15 years for sagebrush to need re-treatment
Mt. Terrel	Richfield	1430	7/9/2004	Completed 2010	Dixie Harrow to improve summer range vegetation for wildlife and livestock NEPA in progress	Areas will completely recover hydrologically within three years. Ten to 15 years for sagebrush to need re-treatment
North Cedar Mt.	Richfield	600	5/5/04	Ongoing	Dixie harrow and brush saw pinion/juniper in old chaining area to set back conversion to trees	The areas will completely recover hydrologically within three years. Ten to 15 years for sagebrush to need re-treatment

Project Name	Unit	Acres	Decision Date	Date Completed	Brief Project Description	Current Residual Effects and Duration
Twin Peaks – Dixie Harrow		578	8/30/10	Ongoing	Dixie harrow and brush saw pinion/juniper in old chaining area to set back conversion to trees. Wildlife and big game range improvement	The areas will completely recover hydrologically within three years. It will take 10 to 15 years for sagebrush to need re-treatment
Twin Peaks Rx Fire	Richfield	5169	8/30/10	Ongoing	Prescribed fire to reduce fuels and improve wildlife habitat	Fire will recover rapidly but effects will still be present 10 years following treatment

3.5 WILDLIFE

3.5.1 Affected Environment

The FNF has a large diversity of habitats, ranging from low elevation shrub-steppe around 5,000 feet, extensive aspen habitats from the mid to upper elevations, and high alpine krumholtz on the Tushar Mountains over 12,000 feet. Because of this variety, there is a great diversity of fish and wildlife species on the FNF. In fact, the FNF contains more than 300 different species of wildlife. The habitat areas on the Forest are important for the conservation of federally listed species, regionally listed (USDA FS) sensitive species, and game and non-game species.

The white paper "Life History and Analysis of Endangered, Threatened, Candidate, Sensitive, and Management Indicator Species of the Fishlake National Forest" (Rodriguez 2006) is a comprehensive description of life histories, population trends and habitat requirements for species that occur or have habitat within the FNF, and is hereby incorporated by reference. Existing condition, or affected environment, for each species is described in the species specific sections below, followed by a disclosure of anticipated impacts, or environmental consequences. Impacts, effects, and environmental consequences are synonymous terms.

Cumulative Effects Analysis Area

The cumulative effects area (CEA) for the wildlife species analyzed in this document includes approximately 1.8 million acres; including 492,934 acres on the Fillmore Ranger District, 520,958 acres on the Fremont River Ranger District, 313,062 acres on the Beaver Ranger District and 459,631 acres on the Richfield Ranger District. Since this project encompasses potential hydrocarbon energy leases across the entire forest, the cumulative effects area was selected based on entire Ranger Districts. These large areas will cover the scope of the project and adequately analyze the species involved. It includes known or predicted use areas by species analyzed in this document during all or portions of their life cycle. The past, present and reasonably future activities within the CEA include, grazing, recreation, timber and thinning operations, natural and prescribed fire, weed control, and other special uses.

Table 3.5-1 Suitability of habitat for threatened, endangered, candidate, Sensitive, and Management Indicator Species by Ranger District.

SPECIES	STATUS	FILLMORE	FREMONT RIVER	BEAVER	RICHFIELD	HABITAT UNSUITABLE BASED ON THE FOLLOWING
THREATENED (T), ENDANGERED (E) AND CANDIDATE (C) SPECIES						
California Condor	E	U	U	U	U	Current breeding range does not include FNF
Mexican Spotted Owl	T	N	Y	N	N	Occurs only on Teasdale portion of Fremont River RD
Utah Prairie Dog	T	N	Y	Y	Y	Currently occurs only on Fremont River RD, historical reintroduction sites on Beaver RD
Yellow-Billed Cuckoo	C	U	U	U	U	Surveys have been conducted, no observations

SPECIES	STATUS	FILLMORE	FREMONT RIVER	BEAVER	RICHFIELD	HABITAT UNSUITABLE BASED ON THE FOLLOWING
Greater Sage-Grouse	C	Y	Y	Y	Y	No observations on the Fillmore RD in last 10 years
Least chub	C	N	N	N	N	Does not occur on FNF
INTERMOUNTAIN REGIONAL FORESTER'S SENSITIVE SPECIES						
Bald Eagle	S	Y	Y	Y	Y	Winter use only
Bighorn Sheep	S	N	Y*	N	N	*Intermittent occurrence along border with Capitol Reef NP
Peregrine Falcon	S	Y	Y	Y	Y	
Spotted Bat	S	U	U	U	U	Surveys have been conducted, no observations
Townsend's Big-eared bat	S	Y	U	U	U	Surveys have been conducted, observed only on Fillmore RD
Northern Goshawk	S	Y	Y	Y	Y	
Flammulated Owl	S	Y	Y	Y	Y	
Three-toed woodpecker	S	Y	Y	Y	Y	
Greater Sage-grouse	S	Y	Y	Y	Y	Have not been observed on the Fillmore District
Yellow-billed cuckoo	S	U	U	U	U	Surveys have been conducted, no observations
Pygmy Rabbit	S	Y	Y	Y	Y	Have not been observed on the Fillmore and Richfield Districts
Boreal Toad	S	U	Y	U	Y	
Bonneville Cutthroat	S	Y	Y	Y	Y	
Colorado River Cutthroat	S	Y	Y	Y	Y	
Leatherside Chub	S	N	Y	U	Y	
FISHLAKE NATIONAL FOREST MANAGEMENT INDICATOR SPECIES (MIS)						
Elk	MIS	Y	Y	Y	Y	
Mule Deer	MIS	Y	Y	Y	Y	
Northern Goshawk	MIS	Y	Y	Y	Y	
Sage Nesters1	MIS	Y	Y	Y	Y	
Cavity Nesters2	MIS	Y	Y	Y	Y	
Riparian Nesters3	MIS	Y	Y	Y	Y	
Macroinvertebrates	MIS	Y	Y	Y	Y	
Northern Flicker4	MIS	N/A	Y	N/A	N/A	MIS only on Teasdale portion of Fremont River RD (DNF)
Wild Turkey 4	MIS	N/A	Y	N/A	N/A	Only on Teasdale portion of Fremont River RD (DNF)

SPECIES	STATUS	FILLMORE	FREMONT RIVER	BEAVER	RICHFIELD	HABITAT UNSUITABLE BASED ON THE FOLLOWING
Bonneville Cutthroat Trout	MIS	Y	Y	Y	Y	
Rainbow Trout	MIS	Y	Y	Y	Y	
Cutthroat Trout	MIS	Y	Y	Y	Y	
Brown Trout	MIS	Y	Y	Y	Y	
Brook Trout	MIS	Y	Y	Y	Y	

Y = habitat exists on the identified districts and will be analyzed. N = habitat does not exist and species will not be analyzed further.
U = unknown habitat or occupancy status and species will be analyzed.
1-- Brewer's Sparrow, Vesper Sparrow, Sage Thrasher
2-- Hairy Woodpecker, Western Bluebird, Mtn. Bluebird
3-- Lincoln's Sparrow, Song Sparrow, Yellow Warbler, MacGillivray's Warbler
4-- Dixie National Forest Management Indicator Species – Teasdale portion of the Fremont River District

3.5.2 Environmental Consequences

3.5.2.1 General Effects to Wildlife

NEPA requires that effects in an EIS be discussed in terms of context and intensity. Context refers to the location, type, or size of the area to be affected relative to each resource component. Intensity refers to the severity or level of magnitude of impact. Intensity of effects is defined as Major, Moderate, Minor, or Negligible. In addition, the duration of effects can be temporary, short-term, or long-term. These terms are described more specifically in table 3.5-2. The analysis in this document focus on how the proposed action may affect current potential to support a given species on a Forest-wide scale, and the terms used in species analysis reflect this context. Thus, while the effects to an abundant and widespread species may be substantial to individuals in the immediate region of the action, the over-all effects of the action may be determined to be of Minor intensity given the extent and distribution of available habitat across the FNF as a whole.

Table 3.5-2 Summary of terms used to describe effects in the specialist report

ATTRIBUTE OF EFFECT		DESCRIPTION
Quality	Beneficial	An improvement of current conditions.
	Adverse	A degradation of current conditions.
Magnitude (Intensity)	Negligible	No measurable change in current conditions.
	Minor	A small, but measurable change in current conditions that will not alter habitat effectiveness for a species.
	Moderate	A change in current conditions extensive enough to alter local habitat effectiveness or displace some individuals, but not of a sufficient scale to affect the status of a species Forest-wide.
	Major	A large, easily measured change in current conditions that will alter habitat effectiveness or result in displacement of individuals to the extent that population levels and/or reproductive rates will likely change for that species Forest-wide.
Duration	Temporary	Short-lived (i.e., during construction).
	Short-term	10 years or less.
	Long-term	More than 10 years.

The main impacts to fish and wildlife that are possible from land clearing include mortality, injury, and habitat modification, habitat fragmentation, and loss. For wildlife, the destruction of occupied burrows or nests, displacement, and the direct disturbance of habitat during land clearing would result in direct impacts. The loss of forested habitats, as well as, sagebrush, would generally be long-term, while the loss of grassland or forbs could be short-term if areas re-vegetate with native species. For fish, land clearing in the vicinity of an occupied stream can increase the potential for delivery of organic molecules, sediments, nutrients, salts, and heavy metals (Trombulak and Frissel 2000) or surface water runoff because vegetation is no longer present to block or dilute such introductions. Roads are often located closer to streams than well pads and are more likely to cause erosion or provide a channel for delivery of hazardous substances. These occurrences can degrade habitat and ecosystem functioning, which may affect fish habitat (e.g., water temperature, stream bank vegetation, large woody debris). Fishlake National Forest Oil and Gas Operating Standards (Appendix F) are designed to avoid these impacts.

For most wildlife species, the area of affected wildlife habitat would be far larger than the area directly occupied by oil and gas activities. Indirect effects such as avoidance and stress responses by wildlife to increased human activity extend the influence of each well pad, road, and facility. The extent of human influence varies by habitat type and species, but may extend up to two miles or more for species such as mule deer (Sawyer et al. 2006). In some cases the result is partial, or even total, loss of habitat effectiveness for the species within the area of influence. Loss of habitat due to human disturbance (displacement) may cause individuals to experience lower reproductive success, decreased body condition or mortality. The increase in density of individuals in the remaining area may lead to greater competition for limited resources and further stress. Displacement is more likely to have negative impacts when it occurs in key habitat types or during sensitive periods such as breeding or rearing of young. Small, isolated disturbances within non-limiting habitats may be of minor consequence within most ecosystems. However, larger-scale developments within key habitat may have moderate to major impacts on wildlife populations because the undisturbed habitat surrounding the disruption is less likely to be as suitable (WFGD 2004).

Fragmentation of wildlife habitats is a concern with oil and gas activities due to the linear extent of many activities, including seismic exploration and roads connecting well pads. For larger mammals, fragmentation may hinder migration and dispersal. Smaller species such as small mammals and reptiles are affected by single roads that may split a population in half and prevent migration in and out. Road crossings in streams can create barriers to fish movement (Trombulak and Frissel 2000), which can isolate fish populations. Fragmentation of fish and wildlife populations leads to reduced genetic diversity and increased susceptibility to population decline. Under certain circumstances fragmentation may enhance habitat effectiveness by creating barriers to disease transmission or blocking the spread of invasive or exotic species (i.e. fish barriers and Bonneville cutthroat trout recovery), but these cases tend to be the exception and habitat fragmentation is usually detrimental to wildlife populations.

Impacts to wildlife and fisheries resources from the different phases of oil and gas development depend on the duration, amount, and type of disturbance involved. The following phases as described in the RFDS are discussed in terms of possible impacts to all wildlife species: seismic activity, exploratory drilling and road construction, and production.

Seismic Activity - Seismic exploration involving both buggies and helicopters would temporarily disturb wildlife, due to noise and human presence, in the vicinity of operations. Noise would be produced mainly by the explosives used to generate vibrations. Mobile wildlife will probably move away from the disturbance and return to the area once the activity is completed. Seismic activities would have a negligible impact on fisheries because surface disturbance is minimal and vibrations would be temporary. In terms of habitat impacts, seismic activities would involve temporary impacts because vegetation crushed by overland travel would soon recover; likely the following year for herbaceous vegetation. Shrubs and small trees would take longer to recover, and such vegetation crushed during seismic activity may not be suitable as cover or nesting structure in the short-term (up to 10 years).

Exploratory Drilling and Road Construction - Exploratory drilling involves the construction of dill pads and access roads, which alters wildlife habitat (land clearing), impacts stream channels, and increases the potential for the introduction of sediment and hazardous materials to the aquatic system. Disturbance to wildlife caused by intermittent human presence on an exploration well would be short-term, lasting for the duration of operations. Direct mortality may occur to smaller species, such as rodents, reptiles, and (nesting) birds, during construction of the pad and roads. Noise disturbances from the actual drilling would be temporary. Human presence and noise could cause mobile individuals in the vicinity to be displaced; individuals may or may not return to the area after reclamation. Fish could be affected by streams crossings (culverts), and by the potential for habitat degradation, caused by increases in sediment yield, short-term pulses of turbidity, and chemical contamination that are the result of construction and use of developments near streams.

Production - A production field would involve the largest amount of disturbance and the most adverse impacts to wildlife. After production wells are constructed, human presence and noise may continue for the first year; in subsequent years these disturbances would drop to about one person per day. Because of direct habitat loss to roads and structures and indirect loss due to displacement the area surrounding each production well could potentially be unsuitable for many wildlife species for the life of the project. Direct mortality could occur during construction to any small, less mobile species within disturbance footprints. Fishes could be impacted during this time by noise and any additional road building in proximity to or across occupied streams.

3.5.2.2 Effects to Wildlife by Species

Effects to wildlife is organized first by status of the species (federally listed, sensitive, MIS, other species of concern), followed by a species specific analysis. The cumulative effects area for the wildlife species analyzed in this document includes approximately 1.8 million acres; including 492,934 acres on the Fillmore Ranger District, 520,958 acres on the Fremont River Ranger District, 313,062 acres on the Beaver Ranger District and 459,631 acres on the Richfield Ranger District. Since this project encompasses potential hydrocarbon energy leases across the entire forest, the cumulative effects area was selected based on entire Ranger Districts. These large areas will cover the scope of the project and adequately analyze the species involved. It includes known or predicted use areas by species analyzed in this document during all or portions of their life cycle.

Federally Listed Threatened, Endangered, or Proposed Terrestrial Wildlife

A lease notice was developed for each listed species within the FNF in coordination with USFWS and will be attached to leases. The lease notice includes minimization and avoidance measures designed to assure activities carried out on the lease are in compliance with the Endangered Species Act. Additional consultation with USFWS will be required at the project stage.

California Condor

No observations of California condors have been documented on the Fishlake National Forest. It is possible, however, that condors could cross the forest since they are known to occur on the Dixie National Forest, Grand Canyon to the south, are occasionally sighted in southern Utah, south of the forest, near Zion National Park, and have been sighted in northern Utah at Flaming Gorge Reservoir. It is also possible that condors could extend their range to include habitat on the FNF over the life of this document, so California condors are carried forward in the analysis even though they are not known to occur on the forest at this time.

The FNF contains cliff and canyon habitat – referred to as "rim" habitat -- similar to that used for nesting and roosting in areas occupied by condor. A total of 62,740 acres of rim habitat with the potential to be used by condor as future nesting or roosting habitat was identified on the FNF using GIS techniques. The amount and percentage of rim habitat open to oil and gas development are listed in Table 3.5-3. While rim habitat is fairly limited in area, nearly all land administered by the FNF could be considered potential foraging habitat for California condor.

Lands administered by the FNF east of Interstate-15, south of Interstate-70, and west of HWY-191 are included in the Nonessential Experimental Population Area (USDI 1996). Under section 10(j) of the Endangered Species Act, federal agencies are not required to ensure that their activities are not likely to jeopardize the continued existence of condors within the designated Nonessential Experimental Population Area (USDI 1996). Approximately 88% of potential condor rim habitat on the FNF falls within this area. On the remaining habitat north of I-70 and west of I-15 condor are considered fully endangered and receive complete protection under the ESA.

Table 3.5-3 Potential California condor nesting and roosting (rim) habitat that would be open to long-term oil and gas development for each proposed alternative subsequent to leasing

Habitat Type	Alternative			
	A	B	C	D
Potential rim habitat open for development (acres) in Endangered area	0	7,364	293	0
% of potential rim habitat subject to development in Endangered area	0%	100%	4%	0%
Potential rim habitat open for development (acres) in Experimental Nonessential Population Area (10j)	0	55,376	2,947	0
% of potential rim habitat open for development in Experimental Nonessential Population Area (10j)	0%	100%	5%	0%

General Effects

There is little research on how oil and gas activities may affect California condor populations, but general causes of mortality have been well documented for this species (USDI 1996). Poisoning is a major cause of death, in part due to the tendency for condors to consume items of trash and fluids such as anti-freeze. Condors are particularly susceptible to lead poisoning and ingesting fragments of lead bullets has been a major challenge to recovery. Any litter, chemicals or toxic fluids associated with oil and gas activities could increase condor mortality.

Condors readily use power-poles for roosts, and collision with power-lines and structures associated with any new oil fields could be a source of mortality. Condors are also attracted to open water, and could potentially drown or ingest toxins or chemicals from waste water ponds used during the production or drilling process. These risks are likely minor, and could be further mitigated at the project level.

Oil and gas activities will likely have negligible direct impacts to condor foraging habitat, since this habitat is abundant and condor exhibit a degree of tolerance to human activity while feeding. The predicted level of surface disturbance represents less than 1% of potential condor foraging habitat on the FNF. A minor (2.6%) direct loss of nesting (rim) habitat to surface disturbance could occur if all development predicted in the RFDS were to take place within this habitat. Indirect effects of oil and gas activities occurring near cliff and canyon habitat during more sensitive nesting, brooding and fledging periods could displace breeding adults and have an adverse effect on condor reproductive success.

Effects Specific to Alternatives A and D

There are no current oil or gas leases on the forest; therefore, if the no action alternative (Alternative A) is selected there would not be any effects to California condor individuals or habitat from oil or gas development. Similarly, there would be no effects if Alternative D is selected since this option would not allow leasing on the habitat of federally listed species outside of the non-essential experimental population area.

Effects Common to Action Alternatives B and C

Under Alternative B, exploratory or production activities authorized in nesting or foraging habitat could occur on 62,740 acres or 100% of the rim habitat on the forest. NSO stipulations in place to protect other resources under Alternative C would limit the amount of rim habitat open to 5% and 4% of areas of the FNF included in the experimental/non-essential or endangered recovery areas, respectively.

Cumulative Effects

There would be no cumulative effects under Alternatives A and D since there would be no oil and gas activities in potential condor nesting and roosting habitat. Under the action alternatives B and C, past, present, and reasonable foreseeable future actions in condor habitat include fragmentation from development and roads; livestock grazing; vegetation changes due to reduced frequency of burning and the increased potential for larger and more intense fires, recreation; and mineral developments. Cumulative effects of oil and gas activities when added to these actions may reduce the effectiveness and availability of habitat within the Action Area, as the amount of suitable habitat changes depending on levels of development and other land uses. Depending on the location, the addition of post-leasing activities (connected actions) in condor rim habitat could contribute to adverse effects by reducing nesting and roosting habitat effectiveness and possibly hindering establishment of this species.

Determination

There would be no effect on California condor or their habitat from the implementation of Alternative A because oil or gas leasing would not occur on the forest. Alternative D prohibits leasing designated habitat of federally listed species, so there would be no effect on condor populations or habitat outside the Nonessential Experimental Population Area if this alternative is selected.

Implementation of connected actions as well as cumulative effects under action alternatives B and C May Affect, and are Likely to Adversely Affect California condors on lands administered by the FNF west of I-15 and north of I-70, where they are listed as endangered. Due to their mobility and northward expansion it is feasible that condors could occur on FNF during the life of this document. Because the location and extent of future oil and gas development are unknown at this time it not possible to rule out adverse effects to condor individuals or habitat on a forest-wide scale. Once development plans are known, it is likely steps can be taken at the project level to minimize or eliminate potential adverse impacts to this species.

On suitable rim habitat on FNF lands within the Nonessential Experimental Population Area (east of I-15 and south of I-70), activities associated with oil and gas production under Action Alternatives B, C and D would not jeopardize this experimental and non-essential population.

Mexican Spotted Owl

The USFWS has designated 17,749 acres of critical habitat on the forest; all of which occurs within Wayne County on the Teasdale portion of the Fremont River Ranger District. All designated habitat occurs in areas with high potential for oil and gas development.
During recent years, potentially suitable habitats within Wayne County were surveyed for Mexican spotted owls. There are two nest locations on the Fishlake National Forest, both on the Teasdale portion of the Fremont River Ranger District. The Forest Service has designated Protected Activity Centers (PAC) around each nest site totaling 1,648 acres. One PAC is within the U.S. Fish and Wildlife Service designated critical habitat area, while the second lies mostly outside designated critical habitat. Analysis of effects to this species will be evaluated among alternatives by examining differences in the number of acres of designated critical habitat impacted by the reasonably foreseeable development scenario.

Table 3.5-4 Acres and percent of designated critical Mexican spotted owl habitat, by Alternative

Lease Option	Alternative A		Alternative B		Alternative C		Alternative D	
	Acres	%	Acres	%	Acres	%	Acres	%
TL	0	--	0	0%	0	---	0	--
NL	16,101	91%	0	--	0	--	16,101	91%
NSO	0	--	0	--	13,870	78%	0	--
SLT&C	0	--	0	--	0	--	0	--
PAC (NSO)	1,648	9%	1,648	9%	1,648	9%	1,648	9%

General Effects
The direct and indirect effects on Mexican spotted owls from oil and gas activity could result from habitat loss or impacts to the prey base. In Utah, Mexican spotted owls nest in steep walled canyon complexes (Rodriguez 2006), and while direct impacts to nesting habitat could occur the rugged nature of these areas would likely discourage the placement of permanent structures. Direct loss of foraging habitat and indirect affects due to disturbance caused by development adjacent to nesting habitat are somewhat more likely to occur. Habitat surrounding known active nest sites (PACs) would be protected from long-term development under all alternatives.

Effects Specific to Alternative A
If the no action alternative (Alternative A) is selected there would be no additional oil and gas leasing and therefore there would not be any effects to Mexican spotted owl individuals or habitat from oil or gas development.

Effects Specific to Alternative B
Under alternative B, all MSO habitats outside PACs would be open to development. If all oil and gas activities projected in the RFDS were to occur in MSO habitat, up to 8% of Designated Critical Habitat could be directly affected. Seismic activities could cause some direct loss of foraging and nesting habitat, however, this loss would be short-term and minor and would not exceed 2% of designated critical habitat on the FNF. Indirect impacts such as displacement of owls due to noise and human activity would likely extend the amount of habitat affected during seismic exploration, but these impacts are expected to be temporary in nature and owls would likely quickly return to normal use patterns once seismic activities are complete. Seismic activity occurring in MSO habitat during the breeding season (March 1 – August 31) could potentially cause owls to abandon nest sites and lead to reduced nesting success. Construction and operation activities that would have more lasting impacts could alter or remove up to 6% (1,021 acres) of USFWS Designated Critical Habitat. Indirect effects due to noise and human disturbances would increase this estimate, and the overall effect could be a minor-to-moderate reduction in habitat effectiveness for this species.

Effects Specific to Alternative C
Under Alternative C, only 13% of MSO Designated Critical habitat would be open to the placement of roads and permanent structures due to NSO restriction in place for MSO and other resources. However, if all oil and gas activities projected in the RFDS (1,421 acres) were to occur in this area the extent of habitat loss would be similar to that of Alternative A (up to 8% of designated critical habitat) (see Table 3.5-4). Under Alternative C seismic exploration would be allowed across all Mexican spotted owl habitat, which could cause some direct loss of foraging and nesting habitat; however, this loss would be short-term and minor and would not exceed 2% of the designated critical habitat on the FNF. Indirect impacts such as displacement of owls due to noise and human activity would likely extend the amount of habitat lost during seismic exploration, but these impacts are expected to be temporary in nature and owls would likely quickly return to normal use patterns once seismic activities are complete. Under alternative C a lease notice developed for this species in coordination with USFWS and attached to leases with MSO habitat would restrict seismic activity around active nests from March 1st to August 31st.

Construction and operation activities that would have more lasting impacts could alter or remove up to 6% (1,021 acres) of USFWS Designated Critical Habitat, although indirect effects due to noise and human disturbances would increase this estimate. While some of the proposed activities would have positive effects on habitat conditions (i.e. re-vegetation of test well sites providing better habitat for some prey species) the majority of predicted impacts are likely to be negative and result in a potential minor decrease in habitat effectiveness. No long-term effects would occur in the PACs since these areas would be NSO.

Effects Specific to Alternative D

Alternative D would not allow leasing of oil or gas rights within designated critical Mexican spotted owl habitat. Under alternative D adverse effects to Mexican spotted owls and spotted owl habitat can still occur because the extent, timing, and location of disturbances are unknown at this time and it is impossible to predict where owls may occur or be located in the future.

Cumulative Effects – All Alternatives

Past, present, and reasonable foreseeable future actions in Mexican spotted owl habitat include fragmentation from roads and trails; livestock grazing; vegetation changes due to reduced frequency of burning and the increased potential for larger and more intense fires, insect outbreaks, timber harvests and encroachment of climax species; recreation; and mineral developments. The cumulative effects of these actions have and will continue to impact the effectiveness and availability of habitat within the Action Area, by increasing human access into steep-walled canyon habitats and reducing the amount of available foraging and wintering habitat for Mexican spotted owls. The addition of post-leasing activities (connected actions) in Mexican spotted owl habitat would contribute to further loss of available habitat. Specifically, post-leasing activities could introduce a potentially persistent and long-term disturbance that could render the area unsuitable for nesting, roosting, and foraging due to noise, human presence, and direct disturbance (e.g., removal of vegetation) for the life of this document.

Determination and Rationale

Alternative A - There would be no effect on Mexican spotted owls or their habitat, including potential habitat, or designated critical habitat from the implementation of Alternative A (no action) because in either alternative, oil or gas leasing would not occur in designated or potential Mexican spotted owl habitat.

Alternative B, C & D - Implementation of connected actions, as well as cumulative effects under the Alternative B, C & D, May Affect, and are Likely to Adversely Affect the Mexican spotted owl and designated critical habitat.

Mexican spotted owls are vulnerable on the FNF due to low numbers and a limited, localized distribution. Because the extent, timing, and location of disturbances are unknown at this time and it is impossible to predict where owls may occur or be located in the future, adverse effects to the species and its habitat cannot be ruled out. It is likely that potential impacts can be mitigated at the project level once development plans are known.

Utah Prairie Dog

There are 10,596 acres of occupied Utah prairie dog habitat on the Fishlake National Forest. The majority of this acreage is within the Fremont River District, however, it also includes an area in the Gooseberry drainage on the Richfield District, and four historic translocation sites; three are in the Fishlake basin on the Fremont River Ranger District, and one near Rocky Reservoir on the Beaver Ranger District. These translocation sites comprise 428 acres of potentially suitable habitat. To date, however, these transplants have been considered unsuccessful, with no prairie dogs occupying these sites. Nevertheless, these transplant sites have been grouped with other occupied Utah prairie dog habitat for this analysis. Utah prairie dog colonies have been mapped in the field using accurate GPS technology by the UDWR Utah prairie dog survey crews with assistance from Forest Service Biologists and field crews. The UDWR delineated Utah prairie dog habitat by buffering the colony (actual prairie dog holes) by 0.5 mile buffer to account for missed holes and an area for colony expansion.

General Effects

The direct impacts to Utah prairie dog from oil and gas activity would be primarily from habitat alteration due to the construction of roads, facility pads and other infrastructure. Indirect impacts include fragmentation of habitat near existing colonies which would block or constrain population movement and colonization of new areas, the potential for higher mortality from avian predators using oil structures as roost sites, and increased shooting losses due to better access from new or improved roads servicing oil and gas facilities.

Effects Specific to Alternative A

If the no action alternative (Alternative A) is selected there would be no additional oil and gas related activities on the forest, therefore there would not be any effects to Utah prairie dog individuals or habitat.

Effects Specific to Alternatives B

Under Alternative B, all known Utah prairie dog habitat on the FNF would be open to oil and gas exploration and development. If all projected activities were to occur within UDWR mapped UPD habitat roughly 13% would be directly impacted. Indirect affects due to noise and human disturbance would increase this estimate, resulting to overall impacts that would be moderate in magnitude and range from temporary to long-term in duration. A Lease Notice developed in coordination with the USFWS (Appendix A -- Conservation Measures) would provide a level of protection by requiring surveys and locating developments away from active colonies when possible.

Effects Specific to Alternatives C

Under Alternative C roads, well sites, or other developments would not be allowed within 0.5 miles of an active colony. This would provide effective protection for known existing colonies, although following leasing Utah prairie dogs may be attracted to sites outside of the 0.5-mile buffer that are suitable habitat or become suitable due to ground disturbance. The Lease Notice (Appendix A) developed in coordination with the USFWS would apply in these circumstances. Seismic surveys would be allowed within the 0.5 mile buffer around colonies, and could directly impact up to 395 acres of Utah prairie dog colony areas across the Forest (approximately 4 percent of the occupied and suitable habitat) if all seismic activity were to occur in prairie dog habitat. Seismic activities within colony areas would likely disturb prairie dogs, possibly making individuals temporarily more susceptible to predator attacks due to noise and hindering social interactions (Magle et al 2005).

Under Alternative C there is the potential that new roads and developments associated with oil and gas development could fragment existing habitat and hinder movement of prairie dogs between colonies as well as inhibit the expansion of existing colonies or the establishment of new colonies.

Effects Specific to Alternative D
Alternative D would not allow leasing of oil or gas rights within UDWR designated Utah prairie dog habitat. This area identifies both colony locations and a buffer for prairie dog expansion.

Cumulative Effects – Alternatives A & D
There would be no additional effects under alternatives A and D, and therefore no cumulative effects if either of these alternatives were selected.

Cumulative Effects – Alternatives B & C
Past, present, and reasonably foreseeable future actions in Utah prairie dog habitat include fragmentation from development and roads, livestock grazing, power line development, unauthorized shooting, unauthorized take, and mineral developments. The cumulative effects of these actions have and will continue to impact Utah prairie dogs and the effectiveness and availability of habitat within the Action Area by increasing habitat fragmentation conditions, and directly or indirectly impacting individual Utah prairie dogs. The addition of post-leasing activities (connected actions) from alternatives B and C in future or unknown occupied Utah prairie dog habitat could contribute to some level of habitat loss or alteration.

Determination and Rationale
Alternative A & D - In either alternative A or D there would be no leasing of oil or gas rights on delineated Utah prairie dog habitats, therefore there would be no effect to this species from either alternative.

Alternative B & C - Implementation of connected actions, as well as cumulative effects under Alternatives B & C, May Affect, and are Likely to Adversely Affect the Utah prairie dog. Because the location and extent of future oil and gas development are unknown at this time it not possible to rule out adverse effects to Utah prairie dog individuals or habitat on a forest-wide scale. Once development plans are known, it is likely steps can be taken at the project level to minimize or eliminate potential adverse impacts to this species.

Yellow-billed Cuckoo

Potential cuckoo habitat has been delineated on the forest using a computer model using elevation and riparian vegetation as the main variables (Rodriguez 2006). The model identified 2,664 acres of potentially suitable western yellow-billed cuckoo habitat on the Fishlake National Forest across all districts. The yellow-billed cuckoo has not been documented on the Forest to date despite significant survey efforts in 2002, 2003 and 2004, and ongoing habitat surveys at the project level.

General Effects
Direct and indirect effects on yellow-billed cuckoo from oil and gas activity would be from habitat loss and disturbance during the breeding season.

Effects Specific to Alternative A
There are no current oil or gas leases on the forest, nor have there been any observations of YBCU located on the Forest; therefore, if the no action alternative (Alternative A) is selected

there would not be any effects to yellow-billed cuckoo individuals or habitat from oil or gas development.

Effects Common to Alternatives B & C

Based on No Lease and No Surface Occupancy stipulations from the various resource issues, there would be 2,664 acres of potential yellow-billed cuckoo habitat open to development under alternative B, and 0.4 acres under alterative C. Alternatives B and C both place Lease Notices on all potential yellow-billed cuckoo habitat. Based on the limited amount of acres of potential habitat open to development, protection from the lease notice, and the riparian buffer protection provided in Alternative C, effects to yellow-billed cuckoo individuals or habitat from oil or gas development would be negligible if either Alternative B or C is selected.

Effects Specific to Alternative D

Under Alternative D delineated potential yellow-billed cuckoo habitat would be No Lease. Additionally, no development would occur in a riparian corridor 500' from the water's edge on both sides, and therefore impacts to this species would be negligible.

Cumulative Effects – All Alternatives

Because there would be no incremental effects to yellow-billed cuckoo individuals or breeding habitat as a result of implementing any of the alternatives, there would be no cumulative effects to this species.

Determination and Rationale

Alternative A & D - There would be no effect on yellow-billed cuckoos or their habitat from the implementation of either Alternative A (no action) or D (High Resource Protection), due to the No Lease stipulation.

Alternative B & C - Oil and gas activities under Alternatives B & C are not likely to adversely affect yellow-billed cuckoo individuals or their habitat. Both alternatives contain a Lease Notice restricting development within yellow-billed cuckoo habitat. Alternative C would also prohibit surface development within 300' of riparian areas.

Table 3.5-5 - Summary of effects for federally listed and proposed terrestrial wildlife species

SPECIES	ALTERNATIVES			
	A	B	C	D
California condor (endangered)	NE	MA-LAA	MA-LAA	NE
California condor (nonessential experimental)	NE	NJ	NJ	NE
Mexican spotted owl	NE	MA-LAA	MA-LAA	NE
Utah prairie dog	NE	MA-LAA	MA-LAA	NE
Yellow-billed Cuckoo	NE	MA-NLAA	MA-NLAA	NE

NE = No Effect
MA-NLAA = May Affect - Not Likely to Adversely Affect
MA-LAA = May Affect - Likely to Adversely Affect
NJ = No Jeopardy

Forest Service Region 4 Sensitive Wildlife Species

The Regional Forester identifies Sensitive species as those for which population viability ("persistence") is a concern, as evidenced by significant current and predicted downward trends in population numbers, density, and/or habitat capability that would reduce a species' existing distribution. Sensitive species must receive special management emphasis to ensure their viability and to preclude trends toward endangerment that could result in the need for federal listing (FSM 2672.1).

Bald Eagle

Bald eagles occur in low numbers on the forest during the non-breeding season. In accordance with their migratory patterns, bald eagles begin to appear on the forest in November and December; the lighter the early winter in the northern United States the fewer bald eagles arrive, and the heavier the winter, the more eagles show up. Eagles are scattered in low numbers across the entire forest, foraging and roosting near open water bodies. There are 142,540 acres of potential bald eagle habitat delineated on the forest (Rodriguez 2006). Table 3.5-6 outlines the number of acres of roosting and foraging habitat ("potential bald eagle habitat") subject to oil and gas activity by alternative, as well as the percentage of the total habitat subject to activity. There are no known bald eagle nests on the Fishlake National Forest. However, one nest on private land south of Teasdale, UT is directly adjacent to the forest boundary. A one mile buffer placed around this nest includes 40 acres on the forest.

As the winter progresses, snow deepens and water bodies freeze, eagles move to lower elevation, typically off the forest. There are, however, two winter concentration areas, one on the Fremont River district and one on the Richfield District. Winter concentration areas total 561 acres and are focused on springs and water bodies that stay open late into the winter. Annually approximately 7 to 15 eagles use these concentration areas during the winter and before the water freezes.

General Effects

The effects on bald eagles from oil and gas activity would be due to direct habitat loss from new roads or facility pads, and disturbance, either visual or noise from heavy traffic on existing roads and/or activity at facilities. Disturbances in roosting and foraging areas, especially during the non-breeding period would have less impact on bald eagles since eagles are more mobile and the habitat area available to them is more extensive. Disturbances to nesting eagles are more impacting, because eagles are tied to the nest site and are actively engaged in reproduction and rearing of dependent young. Winter concentration areas have unique attributes and are much more limited than roosting and foraging habitat (<1% of potential habitat). Impacts to these areas could have a disproportionate effect on overall bald eagle habitat effectiveness.

Direct, Indirect and Cumulative Effects Specific to Alternative A

No impacts to bald eagle individuals or habitat should occur from the implementation of the No Action alternative because no additional oil and gas activity would occur on the FNF. There would be no cumulative effects to bald eagle from the No Action alternative, because there would be no incremental effects to add to any impacts from past, present or reasonably foreseeable actions.

Direct, Indirect and Cumulative Effects Common to Alternatives B, C, D

Table 3.5-6 lists the number of acres and percentage of bald eagle foraging and roosting habitat and winter concentration areas not protected under No Lease or No Surface Occupancy stipulations, and therefore potentially subject to long-term oil and gas development. The construction of facilities and infra-structure would result in the direct loss of foraging or roosting habitat under all three of the action alternatives, which could equal up to 1% of the total available foraging and roosting habitat assuming development does not exceed levels predicted in the RFDS (1,421 acres) and all oil and gas activities were to occur in bald eagle habitat. While of long-term duration, these impacts would be negligible in magnitude given the size of the area disturbed relative to the total foraging and roosting habitat available.

Under alternatives C and D winter concentration areas would be NSO and oil and gas activities would not impact these important areas. Under alternative B there could be a major decrease in bald eagle habitat effectiveness on the FNF if all or a significant amount of the anticipated development were to occur in winter concentration areas. However, it should be noted that all winter concentration areas are situated in areas of the forest where the potential for oil and gas development is predicted to be low (Appendix B). The incremental affects from any of the action alternatives, when added to past, present and foreseeable future impacts would not cumulatively push bald eagles over a threshold toward a federal listing, or a decline in population.

Table 3.5-6 Bald eagle habitat subject to oil and gas activity subsequent to leasing

Habitat	Alternative			
	A	B	C	D
Potential habitat open for development (acres)*	0	142,540	86,481	12,125
% of total potential habitat subject to development	0%	100%	60.7%	8.5%
Winter concentration area open for development (acres)	0	561	0	0
% of total winter concentration area subject to development	0%	100%	0%	0%
Nesting area buffer on forest open to development (acres)	0	39.7	38.6	0
% of nesting area buffer on forest subject to development	0%	100%	97.2%	0%

*Potential bald eagle habitat was not available for the Teasdale portion of the Fremont River RD

Determination and Rationale

The No Action alternative would not impact Bald Eagles or their habitat within the FNF. The three action alternatives may impact individuals, but are not likely to cause a trend toward federal listing or loss of viability. This determination is based on the relatively small proportion of predicted disturbance (1,421 total acres) relative to the abundance of roosting and foraging areas within the potential habitat and the mobility of eagles allowing them to move between them easily. Alternatives C and D incorporate enough protective measures to limit impacts to key habitat. While alternative B presents the potential for moderate-to-major impacts to winter concentration areas if development were to occur in these areas, site-specific NEPA evaluations of proposed post-lease activities will be conducted at the APD and field development levels, and site-specific design criteria and mitigation measures can be implemented at that level to mitigate potential impacts to these localized areas.

Peregrine Falcon

There are three known peregrine nest territories on the Fishlake National Forest, one on the Beaver District, one on the Fremont River District, and one on the Fillmore District. There are 38,394 acres of potentially suitable peregrine falcon habitat on the Fishlake National Forest. Across the state, and specifically in southern Utah, peregrine falcon populations have been increasing (Parrish 2007).

General Effects

Direct impacts to peregrine falcon habitat from oil and gas activity would be limited due to the challenges of developing the rocky, steep terrain around cliff faces and from the protections given to riparian and wetland habitats from federal law, as well as, Forest Service policy and guidelines. Potential negative impacts from energy development would more likely be indirect impacts from noise and visual disturbance from human activity adjacent to these habitats. Disturbances adjacent to nest sites are more likely to impact peregrines, than those within foraging habitats because nest areas are fixed, whereas falcons are highly mobile and forage over large areas.

Direct and Indirect Effects Specific to Alternative A

No impacts to peregrine falcon individuals or habitat should occur from the implementation of the No Action alternative, due to the fact that there would be no additional oil and gas development permitted on the forest.

Direct and Indirect Effects Common to Alternatives B, C, D

Effects from any of the three action alternatives (B, C & D) are similar. If all activity projected in the RFDS were to fall within falcon habitat, approximately 4% of the 38,394 acres of potential habitat would be impacted under any of the action alternatives. The main difference between alternatives is the amount of falcon habitat open to development; with alternative B (standard lease terms) subjecting the most potential peregrine falcon habitat to oil and gas development, and alternative D being the most restrictive. Alternative C is between B and D. Table 3.5-7 lists the number of acres subject to oil and gas activity and percentage of the total habitat type open for development. Under alternative C and D development would be restricted in potential falcon habitat due to NSO stipulations included to protect steep slopes, IRAs, and riparian areas.

Table 3.5-7 Potential peregrine falcon habitat subject to oil and gas activity subsequent to leasing

	Alternative			
	A	B	C	D
Potential habitat open for development (acres)	0	38,394	15,844	1,543
% of total potential habitat subject to development	0%	100%	41.3%	4.0%

Cumulative Effects
There would be no cumulative effects to peregrine falcon from the No Action alternative (A), because there would be no incremental effects which would add to any impacts from past, present or reasonably foreseeable actions.

The incremental affects from any of the action alternatives (B, C & D), when added to past, present and foreseeable future impacts would likely be negligible-to-minor. A review of the past, present and reasonably foreseeable actions does not reveal any actions which have had a negative impact on peregrine falcons. This is due largely to the fact that the peregrine falcon was federally protected as a threatened species and projects were designed to avoid impacts to falcons. Past actions on a regional and international basis, which precipitated significant declines in peregrine populations were related to pesticides used in the environment (DDT), rather than impacts to habitat. Ever since 1972 when DDT was banned (EPA 1972) in the United States, and specifically in Utah, peregrine populations have been steadily increasing.

Determination and Rationale
The No Action alternative would not impact peregrine falcon populations. The three action alternatives may impact individuals, but are not likely to cause a trend toward federal listing or loss of viability. The determination of effects is based on the prediction that less than 4% of the habitat (1,421 acres) will be directly affected , cliff nesting areas are not open to development based on NSO stipulations added to protect soils and the inability to place facilities on rocky cliffs, the mobility of falcons which enables them to forage over vast landscapes, therefore, lessening an impact to a specific site within foraging habitat, the legal protections for riparian and wetland areas, and the fact that site-specific NEPA evaluations of proposed post-lease activities will be conducted at the APD and field development levels, and site-specific design criteria and mitigation measures can be implemented at that level.

Spotted Bat & Townsend's Big-eared Bat

These two species are analyzed together in the analysis, because these species utilize similar habitats, and forage in the same way on similar prey (insects).

Both the spotted and Townsend's big-eared bat are rare on the Forest. A uniform forest-wide bat inventory has not been conducted; nevertheless, bat surveys have been conducted on all four districts of the forest (Lengas 1997, Foster 1995). Townsend's big-eared bats have been documented roosting in an abandoned mine in Millard County on the Fillmore District (Diamond and Diamond, 2003). The Diamond study also suggests that there is evidence for Townsend's bats using other (10) abandoned mines in Millard County. Spotted bats have not been documented on the forest, but are suspected to be on the forest based on habitat types and their presence throughout the geographic region. A habitat model for spotted and Townsend's big-eared bat habitat has been developed which identifies know caves and abandon mines, rocky outcrops and cliffs below 10,000'. Based on this model, there are 39,930 acres of potentially suitable habitat for spotted and Townsend's bats on the Fishlake National Forest

General Effects
Roosting habitat for these bats on the Forest is typically difficult to access due its rocky and steep terrain. Human disturbance to roosting bats usually takes the form of rock climbing activities or spelunking (cave/mine exploration), rather than surface type disturbances consistent with oil and gas development activities.

Direct and Indirect Effects Specific to Alternative A
No impacts to spotted bat or Townsend's big-eared bat individuals or habitat should occur from the implementation of the No Action alternative, due to the fact that there would be no oil and gas development permitted on the forest.

Direct, Indirect and Cumulative Effects Common to All Action Alternatives (B, C, D)
Under the three action alternatives (B, C and D), roughly 4% of the modeled potential habitat could be directly affected if all oil and gas activity predicted in the RFDS (1,421 acres) were to occur in bat habitat. While this would represent a minor habitat modification, challenges associated with developing oil and gas facilities or roads on steep rocky cliffs, caves or abandon mine sites make development of these areas less likely and as a result there should be negligible impacts to nesting and roosting habitat for these species. Also, for alternatives C and D only 22% and 0.3% of the potential habitat are open to leasing given the various resource stipulations (Table 3.5-8). Since there would be no effect to spotted bat or Townsend's bat from any of the alternatives, there would be no cumulative effects to these species.

Table 3.5-8 Potential Spotted and Townsend's Bat habitat subject to post-leasing oil and gas activity

	Alternative			
	A	B	C	D
Potential habitat open for development (acres)	0	39,930	8,633	130
% of total potential habitat subject to development	0%	100%	21.6%	0.3%

Determination and Rationale
Alternatives A, B, C and D may impact individuals, but are not likely to cause a trend toward federal listing or loss of viability.

Northern Goshawk, Flammulated Owl, and Three-toed Woodpecker

Northern Goshawk – Surveys for this species have largely been conducted on a project basis, rather than a systematic forest-wide basis. Because of this, the known goshawk territories are likely only a portion of the goshawks using the Forest. There are 77 known Goshawk territories on the forest spread across all four Ranger Districts. Annual monitoring of goshawk territories shows variability in occupancy, but overall a stable trend. Based on the Forest Plan and goshawk amendment, Utah Goshawk Project EA (1999), Reynolds (1992), Graham et al (1999) and Rodriguez (2006), goshawk nesting areas (NAs) and post-fledgling areas (PFAs) have been delineated for the known nests on the forest. The 77 known goshawk territories have a combined total of 13,833 acres of nesting areas and 47,278 acres of post-fledgling area forest-wide.

Flammulated Owl – Flammulated Owls have been surveyed on the Fishlake National Forest since 1992. Survey efforts have been conducted on all districts. Owl response vocalizations have been documented on all ranger districts of the FNF.

Three-toed woodpeckers – Three-toed Woodpeckers are a Priority Migratory Bird Species according to the Utah Partners in Flight Conservation Strategy (Parrish et al., 2002). Utah is important to three-toed woodpeckers because 26-50% of the species total breeding distribution is in Utah (Rodriguez 2006). Formal surveys have been conducted on the Forest; these surveys have been focused in areas of spruce beetle infestation and areas proposed for vegetative treatment. Three-toed woodpeckers were observed on the forest and nests were located. In a study conducted by Brigham Young University, 71 of 251 survey points located in Engelmann spruce habitat type detected occurrences of three-toed woodpeckers.

General Effects

Forested cover types that provide potentially suitable habitat for northern goshawk, flammulated owl and three-toed woodpecker are generally abundant on the FNF, with over one-quarter of the forest (515,924 acres) considered potentially suitable habitat for these species. Based on the level of disturbance predicted in the RFDS, under all proposed action alternates (B, C and D) direct habitat loss to oil and gas activities would be negligible (<1%) when compared to the amount habitat available. There would be an additional loss of habitat to indirect effects (i.e. disturbance, fragmentation), but it is unlikely that total loss of forested habitat would be greater than 5% unless development exceeds RFDS predictions. In certain situations, activities may improve foraging habitat for NOGO or FLOW (i.e. increased prey abundance on re-vegetated well pads) but considering the limited acreage involved these effects would likely be negligible on a forest-wide scale.

While forested habitat is relatively abundant on the FNF, for nesting NOGO, FLOW and TTWO tend to select stands with structural characteristics of old-growth forests, such as large trees and high canopy closure (Greenwald et al 2005). Habitats with these characteristics (key habitat) are far less abundant. Direct and indirect disturbance in such key habitat, especially during the breeding and fledgling period, would have a negative impact on individuals of these species because birds are tied to the nest site and are actively engaged in reproduction and rearing of dependent young.

Direct and Indirect Effects Specific to Alternative A

No impacts to northern goshawk, flammulated owl, and three-toed woodpecker individuals or habitat should occur from the implementation of the No Action alternative, due to the fact that there would be no additional oil and gas development permitted on the forest.

Direct and Indirect Effects Common to All Action Alternatives (B, C, D)

The magnitude of potential impacts to NOGO, FLOW and TTWO foraging habitat would be similar among all action alternatives, with <1% of available suitable habitat being directly affected if all predicted development were to occur in potential habitat. Alternative B would allow development to occur in all potentially suitable NOGO, FLOW and TTWO habitat under Standard Lease Terms and Conditions with no added protection. Under action alternative C, NSO stipulations designed to protect other resources would restrict placement of wells, roads and other structures on 75% of the potential habitat (Table 3.5-9). Protection would be greatest in Alternative D where only a fraction of forested habitat would be open to long-term development (3.5%).

Table 3.5-9 Potential goshawk, flammulated owl, or three-toed woodpecker habitat subject to post-leasing oil and gas activity

	ALTERNATIVE			
	A	B	C	D
Potential habitat open for development (acres)	0	515,924	276,900	18,266
% of total potential habitat subject to development	0%	100%	53.7%	3.5%

Impacts specific to northern goshawk all action alternatives (B, C, & D)
The general statements in the direct and indirect effects common to all action alternatives discussed above are consistent for northern goshawk. No additional stipulations were added to any alternative to specifically protect flammulated owl or three-toed woodpecker or their habitat. However, based on forest plan direction stipulations were attached to Alternatives C and D to provide added protection to two specific key northern goshawk habitats; nesting areas, and post-fledgling areas, and a species-specific discussion is warranted to address potential effects to these habitat types.

Alterative B would allow oil and gas activities to occur in all suitable goshawk habitats, including nesting areas and post fledging areas, under SLT&C with no additional protective measures. If all 1,421 acres of development predicted in the RFDS were to fall in known goshawk territories, this could result in direct impacts to approximately 11% of the 13,242 acres of nesting areas or 3% of the 45,033 acres of post-fledgling areas forest-wide. This would represent a minor loss of post-fledging habitat and a minor-to-moderate loss of nesting habitat.

NSO stipulations added to nesting areas in Alternative C would prohibit locating wells, roads and other structures in this habitat. Also, NSO stipulations included for other resources would provide similar protection on 78% (34,890 acres) of know PFAs. Controlled surface use stipulation would apply to the remaining PFA habitat that would require surveys and may restrict activities on occupied territories from March 1 to September 30. As a result, potential direct and indirect impacts to northern goshawk key habitats should be negligible under Alternative C.

Alternative D stipulates no surface occupancy within either the nest areas or post-fledgling areas and potential effects of oil and gas development to key NOGO habitat would be negligible under this alternative.

It should be noted that only a portion of the available habitat has been surveyed and given the extensive nature of the potential habitat on the forest it is likely northern goshawk are more abundant than current data suggest. Additional protection measures for this species will follow with site specific NEPA analyses at the APD and field development level.

Cumulative Effects – NOGO, FLOW & TTWO
There would be no cumulative effects to northern goshawk, flammulated owl, or three-toed woodpecker from the No Action alternative (A), because there would be no incremental effects would add to any impacts from past, present or reasonably foreseeable actions.

The incremental affects from any of the action alternatives (B, C & D), when added to past, present and foreseeable future impacts would not cumulatively push the northern goshawk, flammulated owl, or three-toed woodpecker over a threshold toward a federal listing, or a decline in populations. A review of the impacts to northern goshawk, flammulated owl, or three-toed woodpeckers from past, present and reasonably foreseeable actions, combined with the impacts from activities in any of the action alternatives would not be sufficient to impact populations due to decreases in habitat effectiveness.

Determination and Rationale - NOGO, FLOW & TTWO

Under the No Action alternative there would be no impact to northern goshawk, flammulated owl, or three-toed woodpecker populations. The three action alternatives may impact individuals, but are not likely to cause a trend to federal listing or a loss of viability.

The determination of effects is based on the predicted magnitude of the proposed actions (1,421 acres) relative to the amount of potentially suitable habitat available. On a forest-wide scale, the expected impacts should not be sufficient to reduce habitat effectiveness or cause population decline. However, this determination also assumes that negative impacts will be mitigated at the project level. Site-specific NEPA evaluations of proposed post-lease activities will be conducted at the APD and field development levels where site-specific design criteria and mitigation measures can be implemented at that level.

Greater sage-grouse

There are known populations of sage-grouse on the Beaver, Richfield and Fremont River Districts of the FNF. Data on these populations only has been collected for the last five years. Because little information exists on the FNF, a determination concerning trend is difficult. However, low population numbers and a long-term downward trend have been documented throughout the west; therefore it is assumed that populations on the forest are in similar condition. The FNF is near the periphery of greater sage-grouse distribution in North America. When compared to the region as a whole, sage-grouse populations on the forest are fairly small, and habitat is somewhat isolated. These factors may make sage-grouse on the forest particularly vulnerable to habitat loss, and at least one model (Aldridge et al. 2008) predicted only a low-to-moderate probability of persistence if current trends continue.

Data and terms (occupied, winter, brood-rearing) used in this analysis were taken from the UDWR habitat coverage for greater sage-grouse (http://dwrcdc.nr.utah.gov/ucdc/DownloadGIS/disclaim.htm). The UDWR estimates there are approximately 189,877 acres of occupied sage-grouse habitat on the Fishlake National Forest (Table 3.5-10). Occupied sage-grouse habitat is further divided into winter habitat (19,394), and brood rearing habitat (171,965 acres) (UDWR greater sage-grouse data 2012). The locations of known leks on the FNF were added to this coverage to identify breeding habitat.

On the Richfield District, sage-grouse have been documented on the south end of Monroe Mountain near the Hell's Hole and Forshea Mountain areas. Based on field observations and radio telemetry data, grouse use this area year-round. There is one known lek in the area. On the Fremont River District, sage-grouse have been documented on the lower Mytoge Mountain near the Forest boundary and near Forsyth Reservoir on Highway 72. They have also been documented during the summer months on the upper Mytoge, Sevenmile, and Tidwell Slopes. On the Beaver Ranger District, sage-grouse have been historically documented using the Rocky

Reservoir area during summer and early fall (brood rearing). On the Fillmore district, there is a small area of historical sage-grouse habitat based on UDWR data; however, no grouse have been documented on the site in the last 20 years.

General Effects

Impacts to sage-grouse from oil and gas activity occur from direct effects of habitat modification and loss; and indirect effects of human disturbance and habitat fragmentation. Sage-grouse are particularly susceptible to human disturbance, especially noise during the breeding (lekking) period and during the nesting and brooding period. Numerous studies have documented adverse impacts to sage-grouse associated with oil and natural gas activity near leks and surrounding nesting and brooding habitat including displacement (Doherty et al 2008, Holloran et al 2010), lower nest initiation (Lyon and Anderson 2003), reduced ability of males to establish breeding territories (Holloran et al. 2010), lower annual survival (Holloran et al 2010), and population declines (Walker et al. 2007). Sage-grouse are susceptible to decreases in habitat effectiveness, particularly in sagebrush-steppe and wet meadow habitat, and wide-scale decreases to sagebrush cover will have an adverse impact on sage-grouse.

Field studies have indicated that West Nile virus (WNV) has had a substantially adverse impact on grouse populations in other states. Mortality estimates for Wyoming populations range from 2.4 to 28.9%. Laboratory experiments have confirmed the susceptibility of greater sage-grouse to WNV infection (Clark et al 2006). West Nile virus is spread by mosquito, and is now found throughout Utah (Utah Bureau of Epidemiology 2010). In 2005 one sage-grouse mortality was attributed to the virus. The construction of ponds associated with oil and gas development could increase larval mosquito habitat and may facilitate the spread of WNV to sage-grouse populations on the forest.

Direct, Indirect and Cumulative Effects Specific to Alternative A

No impacts to sage-grouse individuals or habitat should occur from the implementation of the No Action alternative, due to the fact that there would be no oil and gas development permitted on the forest. There would also be no cumulative effects to sage-grouse from the No Action alternative (A), because there would be no incremental effects to add to any impacts from past, present or reasonably foreseeable actions.

Direct, Indirect and Cumulative Effects Specific to Alternative B

Alternative B (standard lease terms) would open 189,877 acres, or 100% of the total occupied sage-grouse habitat on the FNF, to oil and gas development (Table 3.5-10). Based upon the RFDS, this could temporarily or permanently diminish up to 1,421 acres, or 1%, of sagebrush-steppe habitat within the action area for the life of this document. Additional indirect habitat loss resulting from disturbance, displacement and habitat fragmentation would also occur. Under alternative B, direct and indirect habitat loss resulting from construction activities could adversely affect sage-grouse habitat and individual sage-grouse if construction were to occur during sensitive periods (breeding/brood rearing, wintering), but construction would be temporary in duration although of moderate intensity. SLT&C used to protect sage-grouse under Option B would allow development within 0.5 miles of an active lek, which would not provide enough of a buffer to avoid detrimental effects to sage-grouse reproduction when leks are active (Holloran et al. 2010). Oil and gas infrastructure placed on or near crucial breeding/nesting habitat or on summer brood rearing habitat could have a long-term, moderate-to-major adverse impact on sage-grouse populations.

Cumulative effects to sage-grouse and sage-grouse habitat include pinyon/juniper expansion into sagebrush steppe, authorized and unauthorized road development, increasing OHV use, wildfire, legal and illegal take, invasive weeds, increasing predator populations, power line development, habitat fragmentation and livestock grazing. Of these affects, livestock grazing is the most widespread land use across the sagebrush biome, and most sagebrush habitats have been grazed in the past century (Connelly et al. 2004).

The dynamics of sagebrush communities are complex, and plant species' response to impacts are often difficult to predict. Also, many of the effects of previous actions have been positive; such as habitat and range improvements designed to restore sagebrush ecosystems, and increased water distribution resulting from grazing management. However, given the range-wide decline in sage-grouse populations and the downward trend for sage-grouse on the FNF, it is likely that impacts from oil and gas activities under alternative B, when added to past, present and foreseeable future impacts, may adversely affect greater sage-grouse habitat and have an adverse impact on reproduction and survival.

Direct, Indirect and Cumulative Effects Specific to Alternative C

Under alternative C, nearly 78% of occupied sage-grouse habitat would be NSO to protect sage-grouse and other resources. The remaining 38,560 acres, or 22.1%, of the total occupied sage-grouse habitat on the FNF would be open to some form of oil and gas development. Alternative C would prohibit placement of roads and permanent structures in sagebrush vegetation types within four miles of active leks, where a substantial percentage of hens nest in non-migratory populations (Connelly et al 2000). Population persistence has been correlated to the proportion of sagebrush-steppe habitat within 4 miles of a lek (Walker 2007). The buffer stipulation in this alternative will preserve this area from loss or fragmentation resulting from oil and gas activities. Furthermore, timing limitations on construction activity will provide protection from disturbance on critical habitat located outside the buffer during both the brood-rearing (May 1st through July 5th) and wintering (December 1st through March 15th) periods. Given these restrictions, direct and indirect impacts to sage-grouse habitat and populations would be negligible-to-minor. Incremental effects from Alternative C, when added to past, present, and foreseeable future impacts are unlikely to cross a threshold where sage-grouse habitat effectiveness will be greatly reduced.

Direct, Indirect and Cumulative Effects Specific to Alternative D

Under Alternative D all sage-grouse habitat would be No Surface Occupancy (NSO). Since no construction of roads or permanent structures would occur, oil and gas activities would be virtually non-existent and there would be negligible direct, indirect, or cumulative adverse impacts to sage-grouse habitat or populations under this alternative.

Table 3.5-10, Potential greater sage-grouse habitat subject to oil and gas activity

	ALTERNATIVE			
	A	B	C	D
Potential habitat open for development (acres)	0	189,877	35,860	0
% of total potential habitat subject to development	0%	100%	22%	0%

Determination and Rationale
Because no oil and gas leasing would occur, the No Action alternative (A) would have no effect on greater sage-grouse populations or habitat.

Implementation of Alternative B may jeopardize continued existence or adversely modify proposed critical habitat. Greater sage-grouse populations are trending downward on a broad scale. On the forest, sage-grouse populations exhibit the same downward trend. Current research suggests that measures used under SLT&C may not prevent adverse effects resulting from oil and gas activity from diminishing sage-grouse habitat effectiveness, inhibiting reproduction and affecting survival. Also, under SLT&C site specific development proposals will be critical to limiting impacts to sage-grouse populations, but since specific development patterns are not known at this time and given the general nature of the FRDS and the current status of the species, SLT&C are assumed to be insufficient to protect sage-grouse populations on the forest.

Implementation of Alternative C is not likely to jeopardize continued existence or adversely modify proposed critical greater sage-grouse habitat. Alternative C would subject 22% of sage-grouse habitat to development and could possibly result in habitat loss similar to Alternative B (SLT&C) if all oil and gas activities were to occur in sage-grouse habitat open to development. However, alternative C would protect a large proportion of the key habitats. Under Alternative C sagebrush habitat within 4 miles of active leks will be NSO, and therefore, not subjected to development. This would protect leks, nesting areas, and a large proportion of brooding and wintering areas from negative impacts resulting from long-term oil and gas activities. Additionally, timing limitations would further protect sage-grouse by limiting construction activities in sagebrush habitat types during the critical brood rearing and wintering periods.

Alternative D will have no effect on sage-grouse populations or greater sage-grouse habitat. Under this alternative all sage-grouse habitat on the forest would be NSO and would not be subject to energy development.

This determination of effects for greater sage-grouse is protective in nature, but warranted, based on the current sage-grouse population trend and the potential for disturbance from oil and gas activity. Site specific analysis is not possible at the leasing EIS stage; therefore, regardless of which action alternative is selected, it will be important to detail sage-grouse habitat locations prior to the lease sales, notify potential lessees of sage-grouse issues, and to conduct appropriate NEPA analyses at the project level

Pygmy Rabbit

There are approximately 53,101 acres of potentially suitable habitat on the FNF comprised of tall sagebrush communities. There are only two known locations of pygmy rabbit colonies documented on the FNF, one is on the Fremont River District and the second is on the Richfield District.

General Effects
Indirect impacts of human activity and noise generally have minor to negligible impacts on pygmy rabbits. On the other hand, because pygmy rabbit habitat is very specific and individuals are often concentrated in colonies, oil and gas activities which directly impact the specific stands of big sagebrush where the colony exists can have a long-term, moderate to major impact on

that colony of pygmy rabbits. The standard lease term permits an agency to move a specific well site or road 200 m, which may be sufficient to move a well or road out of pygmy rabbit colony and habitat. Site specific, on the ground surveys would be necessary in order to see and identify these issues.

Direct and Indirect Effects Specific to Alternative A

No impacts to pygmy rabbit individuals or habitat will occur from the implementation of the No Action alternative because there would be no oil and gas development permitted on the forest.

Direct and Indirect Effects Specific to Alternative B

Selection of alternative B would subject 53,101acres of potential pygmy rabbit habitat to oil and gas development (Table 3.5-11). This is 100% of the total pygmy rabbit habitat on the forest. Oil and gas facilities coincident with pygmy rabbit colonies may have a moderate to major impact on a specific colony. Site specific, on-the-ground wildlife surveys will be conducted at the project level, and any colonies found can be avoided by moving facilities up to the 200 meters allowed under SLT&C. As a result, effects under alternative B would be negligible-to-minor, if attention is given to this species and its habitat.

Direct and Indirect Effects Specific to Alternatives C

Alternative C would open 46,004 acres of potential pygmy rabbit habitat to oil and gas development; this is 86.6% of the potential pygmy rabbit habitat on the forest. Specific to pygmy rabbit, alternative C would stipulate no surface occupancy on the known pygmy rabbit colonies on the forest. Potential pygmy rabbit habitat elsewhere on the forest would have standard lease terms and conditions. If all development were to occur within PYRA habitat, up to 2.3% of the available habitat on the forest would be directly impacted by oil and gas activities predicted in the RFDS.

Direct and Indirect Effects specific to Alternative D

No impacts to pygmy rabbit individuals or habitat should occur from the implementation of alternative D, due to the fact that there would be no surface occupancy on potential pygmy rabbit habitat on the forest, and no surface occupancy on the two known pygmy rabbit colonies on the forest.

Table 3.5-11, Potential Pygmy Rabbit habitat subject to oil and gas activity subsequent to leasing

	ALTERNATIVE			
	A	B	C	D
Potential habitat open for development (acres)	0	53,101	46,004	0
% of total potential habitat subject to development	0%	100%	86.6%	0%

Cumulative Effects

There would be no cumulative effects to pygmy rabbit from either alternative A or D, because there would be no incremental effects added to any impacts from past, present or reasonably foreseeable actions.

The incremental affects from alternatives B or C, when added to past, present and foreseeable future impacts would not cumulatively push pygmy rabbit over a threshold toward a federal listing. A review of the past, present and reasonably foreseeable actions does not reveal any actions which have had a negative impact on pygmy rabbit. Projects in or adjacent to potential pygmy rabbit habitat have implemented design criteria or mitigation measures to protect pygmy rabbit colonies and habitat.

Determination and Rationale

The No Action alternative would not impact pygmy rabbit populations, because there would be no oil or gas activity permitted. Similarly, alternative D would not impact pygmy rabbit populations, because the no surface occupancy stipulation would be placed on both potential habitat and known colonies. Therefore, in both alternatives, zero percent (0%) of pygmy rabbit habitat will be open to oil and gas development. Alternatives B and C may impact individuals, but are not likely to cause a trend to federal listing or loss of viability. Known colonies will be NSO under alternative C, and under alternative B if development were proposed on a pygmy rabbit colony, there is authority under the standard lease terms to move proposed facility up to 200m, which would often be a sufficient distance to protect the colony. Additional NEPA review of the pygmy rabbit and its habitat will be conducted at the APD and field development levels, where site-specific design criteria and mitigation measures can be implemented.

Bighorn Sheep

Using the model developed by the Payette National Forest (USDA 2010a), there are an estimated 159,843 acres of potentially suitable habitat on the FNF, 56,704 acres of which can be considered wintering habitat. Nearly all this habitat is unoccupied. There is a viable population of Desert bighorn sheep adjacent to the FNF on Capitol Reef National Park, and individuals or small groups occasionally move onto forest lands along the eastern edge of the Fremont River district. A small group of bighorn inhabited the Thousand Lake Mountain region of the Fremont River from 1999 to present, but UDWR is in the process of removing these animals to mitigate the threat of disease transmission from nearby domestic sheep grazing private, state and BLM administered land (Teresa Griffin, UDWR wildlife manager, pers. Comm.). Currently, there is approximately 11,000 acres of potential habitat along the eastern border of the FRRD that receives at least occasional use by bighorn sheep. The Canyon Mountains on the Fillmore RD is also listed in the UDWR Statewide Bighorn Management plan (UDWR 2008c) as a site for introduction of California bighorn.

The vulnerability of bighorn to diseases carried by domestic sheep requires separation between the two species and makes management of bighorn difficult and often controversial. Bighorn populations are managed by UDWR, and current policy is to discourage expansion of bighorn into areas grazed by domestic sheep on or adjacent to the FNF. However, it is also UDWR policy to aggressively manage for the expansion of bighorn sheep by transplant and encouraging natural pioneering into appropriate habitat. Over the past 20 years, bighorn sheep in southern Utah have increased in both numbers and geographic distribution and it is assumed that this trend will continue. Therefore, this analysis is based on the assumption that current land uses and bighorn population management strategies will persist into the future, but bighorn from adjacent areas will also continue using habitat along the fringes of the FNF and in some cases this use may be compatible with UDWR objectives. This analysis also assumes that there are areas of the forest outside current bighorn distribution that can provide appropriate habitat for this species and that re-introductions could occur on the FNF over the life of this document.

General Effects

The dependence of bighorn sheep on escape terrain and areas of high visibility often results in small, isolated populations occupying “islands” of suitable habitat. Any direct and indirect loss of important habitats resulting from oil and gas exploration, development, and production could have a disproportionally greater effect on bighorn populations than on other native ungulate species with more general habitat requirements, such as deer and elk.

The rugged nature of bighorn habitat should offer some protection against direct habitat loss due to the challenges of locating well pads, facilities and access roads on steep terrain. Therefore, the most likely potential adverse impacts to bighorn will be short and long-term habitat loss resulting from disturbance associated with oil and gas activities adjacent to escape terrain and improved public access following development. Bighorn sheep often move away from disturbances, even if this means switching to lower quality habitat or altering their activity patterns (USDI 1995, Schoenecker and Krausman 2002, Bleich et al. 2009, Keller and Bender 2007). Deviations from normal activity patterns and habitat use caused by human disturbance or direct habitat loss can raise the energy cost of living, often at the expense of energy needed for reproduction and growth (Geist 1971). Impacts may be even more harmful if disturbance coincides with critical periods such as lambing or when bighorn are on winter range. Disturbance from increased human activity and noise during seismic exploration could displace bighorn, but impacts would be temporary and bighorn would likely return soon after activity ceased. Effects from oil and gas activity would be more intense during the construction and drilling phase when the level and intensity of human activity is the greatest (Bromley 1985), but also temporary or short-term in nature. Impacts from construction could be moderate if disturbance occurred on important habitat during times of high stress (lambing, winter), otherwise effects would be negligible.

While less intense, disturbance associated with oil field production and maintenance combined with improved access and increased public use would be long-term in duration. The location of roads and infra-structure in important habitat would expose bighorn to higher levels of stress and possibly result in displacement from these areas. If displaced to less suitable habitat, this could lead to higher foraging costs, higher risk of predation, increased contact with domestic sheep, and ultimately decreased recruitment and lower survival rates.

Direct, Indirect and Cumulative Effects Common to Alternatives A & D

No impacts to bighorn habitat or populations will occur from the implementation of the No Action alternative because there would be no additional oil and gas development permitted on the forest. Similarly, no impacts to bighorn habitat or populations will likely occur from the implementation of alternative D, because no surface activity would be allowed on bighorn habitat. There would be no cumulative effects to bighorn sheep from either alternative A or D, because there would be no incremental effects added to any impacts from past, present or reasonably foreseeable actions. These alternatives would protect 100% of the crucial bighorn sheep habitats from impacts due to oil and gas development activity.

Direct, Indirect and Cumulative Effects Specific to Alternative B

Implementation of Alternative B, the standard lease terms and conditions, would allow oil and gas activities on 100% of both potential winter/year-round (56,703 acres) and summer (103,140 acres) habitats on the FNF (Table 3.5-12). Based upon the RFDS, under Alternative B up to 1.4% of potential suitable bighorn summer habitat and 2.6% of potential winter habitat on the forest could be directly impacted by activities associated with exploration, development and production.

Past, present, and reasonably future impacts in bighorn habitat include livestock grazing; fire suppression and subsequent increase in woody species; illegal take; recreation; increasing OHV use; timber and thinning operations; natural and prescribed fire; and other special uses. Some of these impacts are beneficial to bighorn habitat effectiveness. The incremental affects from alternatives B, when added to past, present and foreseeable future impacts should not move bighorn populations past a threshold toward decreasing population trends and decreased habitat effectiveness, and away from desired future condition.

Direct, Indirect and Cumulative Effects Specific to Alternative C

Under alternative C, all bighorn habitat and potential habitat would be open to seismic exploration. However, no surface occupancy restrictions designed to protect soil resources, Inventoried Roadless Areas, riparian areas and TES plants would prohibit the construction of roads and permanent structures on 145,743 acres (91%) of potential bighorn habitat across the forest. NSO would greatly limit impacts from persistent human disturbance in bighorn habitat. In addition, timing limitations would restrict construction activities in bighorn habitat during the critical lambing and wintering periods.

Cumulative effects in potential bighorn habitat include timber harvest, livestock grazing, mining, both prescribed and uncontrolled fire, power-line construction, oil and gas development and increasing recreation use. Some of these actions have or will result in positive effects to bighorn habitat, such as wildfire and subsequent rehabilitation converting mountain brush communities to grassland types on the Canyon Mountains. The incremental effects from alternatives C, when added to past, present and foreseeable future impacts, are unlikely to decrease habitat effectiveness for this species.

Table 3.5-12, Acres and percentage of suitable occupied bighorn sheep habitat under each alternative

Lease Option	Alternative							
	A		B		C		D	
	Acres	%	Acres	%	Acres	%	Acres	%
TL	0	--	0	0%	14,100	9%	0	--
NL	159,843	100%	0	--	0	--	0	--
NSO	0	--	0	--	145,743	91%	159,843	100%
SLT&C	0	--	159,843	100%	0	--	0	--

Determination and Rationale

The No Action alternative (A) would not impact bighorn sheep habitat or populations, because there would be no additional oil or gas activity permitted on the forest. Similarly, alternative D would not impact bighorn habitat or populations, because the no surface occupancy stipulation will be placed on 100% of the projected winter range or key summer/parturition areas.

Development and production under Alternative B may impact individual bighorn currently using the forest, but is not likely to cause a trend to federal listing or loss of viability since these bighorn appear to be a part of a larger off-forest population. Potential impacts under

Alternative B may be more detrimental to an introduced population such as that proposed on the Oak Creek where initial numbers would be low and isolated from other populations and individuals would be under stress in a new environment. Standard lease terms and conditions may not be sufficient to prohibit oil and gas activities from having moderate impacts to bighorn under such conditions and further mitigation would be needed at the project level if this alternative is selected.

Oil and gas activities under the preferred alternative (Alternative C) may impact individuals, but is not likely to cause a trend to federal listing or a loss of viability. Timing limitations on construction in bighorn habitat and NSO stipulations in place for other resources would insure enough bighorn habitat remained undisturbed and in large enough tracts to maintain effectiveness for any transplants that may occur in the near future. In addition, bighorn sheep populations are trending upward in southern Utah, and this trend is assumed to occur on the forest and adjacent areas as well. Bighorn habitat on the eastern edge of the FNF is only a small branch of a complex that extends roughly 80 miles from Lake Powell, up Halls Creek to the Waterpocket Fold, then along the Fremont River, eventually ending in the vicinity of Thousand Lake Mountain. Given that extensive bighorn habitat and larger populations exist nearby, the status of the species is secure in a regional context.

Boreal Toad

Surveys have been conducted for boreal toad on the forest in likely habitat. Boreal toad populations are generally dependent on wet habitats, either around ponds and lakes or in riparian areas on the forest. Active beaver ponds appear to be an important habitat component in many boreal toad areas. On the FNF Boreal toads are currently known to occur on Monroe Mountain and Thousand Lake Mountain. There is a historical record from Seven-mile Creek north of Johnson Reservoir, and a potentially questionable historical record from the Tushar Mountains.

On Thousand Lake Mountain boreal toads are primarily found around Snow Lake and Deep Creek Lake, although they have been found associated with a ditch system below Deep Creek as far north as Round Lake at 8,800 feet. Primary habitat, based on past surveys, is the high altitude (>9,000 feet) ponds and lakes on the top of Thousand Lake Mountain. On Thousand Lake Mountain boreal toads must occasionally be moving across upland habitat between key use areas. On Monroe Mountain boreal toads have been found from Big Lake on the north, through the headwaters (>8,000 feet) of Koosharem Creek (and the nearby Magalby reservoir on private land), Greenwich Creek, Box Creek, Manning Creek, and Dry Creek. Based on boreal toad observations and knowledge from the 2000 time frame two known important breeding locations of boreal toads have become apparent for their consistent use, production of young, and relatively high density of toad use. These are the Manning Meadows Reservoir area and Barney Lake area. On Monroe Mountain they use lakes, bogs, and beaver ponds for breeding and summer use, using linking streams as movement corridors. Hibernacula were often located on small perennial streams and seeps. In Forest surveys boreal toads appear to be a low density species even in the best of habitats. In 2003-2004 a radio tracking study was undertaken in central Monroe Mountain, otherwise surveys have been limited to summer breeding area surveys and documentation of new sightings, but populations appear stable on the Forest. Breeding and general summer toad use areas were delineated around each of these locations.

Due to the 2003-2004 radio tracking study and general surveys conducted in the intervening years, boreal toad use was better documented. Key habitat areas were mapped on Monroe Mountain, Thousand Lake Mountain, and the Teasdale portion of the Fremont River Ranger District. The areas were mapped as either streams, ponds, and lakes known to be used by boreal toads buffered 300 feet (to be consistent with riparian protection zones) on both sides, or actual areas known to be used for larger wet areas. The 2003-2004 tracking study on Monroe Mountain found the majority, but not all, of toad relocations to be within 100m of water. Thus the 300 foot buffer will include the vast majority of toad use as toad use away from wet areas appears to be declining exponential function. There are likely some small localized areas of use not yet found, temporary toad use areas, temporary toad exploratory movements and potentially overland toad movements between wet drainages (not documented on the Fishlake National Forest, but found in tracking studies in Colorado) that are not included in these mapped key habitat areas. Mapped key habitat for boreal toad on the Fishlake National Forest comprises a total of 5,372 acres.

Across the West a chytrid fungus, considered to be an Aquatic Invasive Species (AIS), appears to be implicated in many of the major declines of boreal toad populations. The Forest tested the Monroe Mountain and Thousand Lake Mountain populations for chytrid fungus in 2006 and all samples came back negative for the presence of this disease.

General Effects

The adverse effects of oil and gas leasing and subsequent development activity on boreal toad would be due to: direct impacts to individuals, primarily from vehicle interactions on roads; habitat loss, or decreases to habitat effectiveness from facilities development (roads, pads and pipelines); from impacts to water quality from activities adjacent to wetlands, riparian areas or standing water (reservoirs and lakes); and from fragmentation of habitat or barriers to movement, usually created by roads or substantial increases in traffic on existing roads.

Direct and Indirect Effects Specific to Alternative A

No impacts to boreal toads or habitat will occur from the implementation of the No Action alternative, due to the fact that there would be no oil and gas development permitted on the forest.

Direct and Indirect Effects Specific to Alternative B

Under alternative B, all 7 acres, or 100% of the key identified boreal toad habitat areas would be subject to development (Table 3.5-13). All other potential boreal toad habitat areas around streams, lakes, and ponds would also be subject to development. Thus in this alternative all or 100% of boreal toad would be subject to development. All action alternatives have required measures on equipment cleaning and water use to prevent the spread of AIS, which could be detrimental to boreal toads.

Direct and Indirect Effects Specific to Alternative C

Under alternative C, no development would occur within the majority of boreal toad habitat use areas. All 7 acres of the key boreal toad habitat area would be protected from development. The difference between the percent of habitat open to development in this alternative and alternative B is the result of the no surface occupancy stipulation within 300 feet of water sources. The radio tracking study on central Monroe Mountain found that the majority of boreal toad use was within 300 feet of water, although toads occasionally use upland habitat beyond this distance. This is particularly true for the Thousand Lake Mountain population, where the habitat lacks streams for effective movement corridors (only having one irrigation ditch line), and toads are more likely to travel overland on uplands between water sources. While some loss of individuals may occur, impacts to habitat would be negligible because the 300' buffer would protect against sedimentation and degradation of water quality, and prevent development in the majority of areas used by boreal toad and therefore minimize both habitat disturbance and the risk of direct injury or burial of toads in burrows from mechanized disturbance.

Table 3.5-13 Key boreal toad habitat use areas subject to oil and gas activity subsequent to leasing

	ALTERNATIVE			
	A	B	C	D
Key boreal toad breeding area habitat open for development (acres)	0	5,372	0	0
% of key boreal toad breeding area habitat subject to development	0%	100%	0%	0%

Effects Specific to Alternative D

Of the three action alternatives, Alternative D protects the largest amount of boreal toad habitat and would nearly eliminate the potential for oil and gas development in boreal toad habitat. All 7 acres of the key boreal toad habitat area would be NSO. Additionally, protection measures in alternative D for water resources stipulate no surface occupancy within 500 feet of any water sources. Boreal toads occasionally use upland habitats greater than 500 feet from water and some loss of individuals may result. However, such losses should be negligible and no decrease in boreal toad habitat effectiveness is anticipated under this alternative.

Cumulative Effects

There would be no cumulative effects to boreal toads from either the No Action alternative (A), or alternatives C or D, because there would be no incremental effects which would add to any impacts from past, present or reasonably foreseeable actions. The incremental affects from alternative B, when added to past, present and foreseeable future impacts, would not cumulatively push boreal toad over a threshold which would contribute toward federal listing.

Determination and Rationale

The No Action alternative would not impact boreal toads or habitat, because the forest would not be open to oil and gas leasing. Similarly, alternative D would have almost no impacts on boreal toads because nearly 0% of the total boreal toad habitat would be subject to development based on the NSO stipulation on boreal toad habitat and on the 500' NSO buffer around perennial water. Alternative B may impact individuals but is not likely to cause a trend to federal listing or loss of viability based on forest standards and guidelines specific to the protection of riparian and wetland areas, and on the amount of development predicted in the RFDS. Alternatives C may impact individuals but is not likely to cause a trend to federal listing or loss of viability. This is based on the protection provided the habitat from the NSO stipulation on a 300 foot buffer around perennial water sources.

The most serious potential adverse impact to boreal toads on the FNF would be the introduction of an Aquatic Invasive Species (AIS). Required guidelines on cleaning equipment and water use common to all alternatives protects against this introduction. The most damaging site-specific action on boreal toads may be toxic spill adjacent to a boreal toad site. Avoidance of this type of action should be covered in both the well pad design and transportation requirements in the Fishlake Standard Operating Procedures, as well as at the site-specific NEPA levels yet to come.

Table 3.5-14 Determination of impact for Sensitive Wildlife Species

Species	ALTERNATIVE			
	A	B	C	D
Bald Eagle	NI	MI-NL	MI-NL	MI-NL
Peregrine Falcon	NI	MI-NL	MI-NL	MI-NL
Spotted Bat	NI	NI	NI	NI
Townsends Big-eared Bat	NI	NI	NI	NI
Northern Goshawk	NI	MI-NL	MI-NL	MI-NL
Flammulated Owl	NI	MI-NL	MI-NL	MI-NL
Three-toed Woodpecker	NI	MI-NL	MI-NL	MI-NL
Greater Sage-grouse	NI	LTFL	MI-NL	MI-NL
Yellow-billed Cuckoo	NI	MI-NL	MI-NL	NI
Pygmy Rabbit	NI	MI-NL	MI-NL	NI
Bighorn Sheep	NI	MI-NL	MI-NL	NI
Boreal Toad	NI	MI-NL	MI-NL	NI

NI = No impacts
MI-NL = May impact individuals but is not likely to cause a trend to federal listing or loss of viability
LTFL = Likely to result in a trend to federal listing or loss of viability

Fishlake National Forest Management Indicator Species

Big Game

Wild ungulates found on the Fishlake National Forest include Rocky Mountain elk, mule deer, moose (*Alces alces)*, Rocky Mountain goat (*Oreamnos americana*), bighorn sheep, and occasionally pronghorn (*Antilocapra americana*). While all of these species are referred to as "big game", for the purpose of this document the term will apply to elk and deer. Mule deer and elk are species with high social and economic importance. Many people visit the forest for viewing opportunities, hunting opportunities and shed antler collecting. Deer and elk occupy almost every acre of vegetated ground on the forest at one time or another during the year. Essentially the entire forest is classified as big game habitat. However, these animals move seasonally to different areas based on traditional summer and wintering ranges, snow depth, human disturbance, precipitation patterns and range condition. Additionally, within these seasonal ranges, there are key concentration areas that are more important to large portions of the population. Through a cooperative process, Federal and State Wildlife Biologists developed habitat maps which delineate substantial and crucial big game habitat.

Population estimates of deer throughout the Utah Division of Wildlife Resources (UDWR 2011) Southern region, including Beaver, Fillmore, Monroe and Plateau units have generally declined over the last 30 years. Recently, (since 2002) populations showed signs of recovery, but a significant decline in 2009 and 2010 reversed these gains. Poor fawn recruitment, which in turn has been attributed to multi-year drought conditions and degrading winter ranges, is responsible for the decline of mule deer in the region. Based on 2010 UDWR winter population estimates mule deer herds on the FNF average 62% of the set population objective. Winter range is the most limiting habitat factor for mule deer in south central Utah. The FNF provides approximately of 17.8% of the deer winter range within the herd units coincident with the FNF.

Within the UDWR Southern Region, elk herds have increased 59% since 2002; the 2010 estimate is 20,150 elk on units that overlap the forest. UDWR uses antlerless hunts as a tool to control elk populations, and the number of antlerless permits has more than doubled (from 1,250 to 2,631) during this same time period. Elk populations on the FNF average 96% of the population objective. Winter range for elk is the most limiting habitat factor in south central Utah. In general, elk winter at higher elevations than deer and the forest provides a large proportion of elk winter range; on average 43% of elk winter range for coincident units. There are 646,245 acres of crucial big game winter range and 45,745 acres of key summer/parturition range on the Forest.

Table 3.5-15 Deer and elk population objective, 2010 population estimate, percent of winter range

	Mule Deer		
Unit	Population Objective	2010 Population/ Status (% of objective)	% of Winter Range on FNF
Central Mtns Manti #16B, C	38,000	20,900 (55%)	6.5
Fillmore #21A, B	12,000	9,000 (75%)	29.2
Beaver #22	11,000	10,900 (99%)	13.8
Monroe #23	7,500	7,100 (64%)	36.8
Plateau #25	25,000	12,000 (48%)	18.8
	Elk		
Unit	Population Objective	2010 Population/ Status (% of objective)	% of Winter Range on FNF
Central Mtns Manti #16B, C	12,000	11,100 (93%)	18.2
Fillmore #21A, B	1,425	1,550 (109%)	54.0
Beaver #22	1,050	1,100 (105%)	54.9
Monroe #23	1,800	1,300 (72%)	50.4
Plateau #25	4,800	5,200 (106%)	36.9

Data Source: UDWR Southern Region

General Effects

Specific direct and indirect impacts to big game are difficult to assess at the leasing analysis stage, because site-specific oil and gas development plans are not known. Impacts to wildlife are based on predictions of development described in the RFDS and assumptions are made that the development may occur on important habitat areas (e.g crucial big game winter range, or key summer areas).

Human disturbances to wildlife are known to have a metabolic cost associated with them (Kucera and McCarthy 1988; Van Dyke and Klein 1996). For many species of wildlife, their energy demands are high and their energy resource budgets are very tight. Deviations from normal activity patterns and habitat use caused by human disturbance or direct habitat loss raise the energy cost of living, often at the expense of energy needed for reproduction and growth (Geist 1971). These costs take the form of physiological excitement, locomotion, lost calorie intake, and sub-optimal habitat selection (Bromely 1985).

Disturbance and displacement of deer and elk caused by road traffic and energy development and facilities reported in the literature ranges between 200 and 1,000 meters (656 to 3,281 feet) (USDI 1995). For this analysis, a disturbance distance of 600 meters, the average distance of the range listed above, has been used for big game.

Winter range is vital to big game populations because it provides the necessary mix of hiding cover, thermal cover, limited snow depth based on elevational precipitation patterns, adequate seasonal forage, and limited human disturbance during a season when the energy cost of survival is very high. Geist (1971) noted that 'excitement from human disturbance costs energy – vital energy needed for survival in winter for the growth of the fawn or calf inside the female.' Hayden-Wing (1979) found that elk distribution on the winter range in Idaho was influenced primarily by human activity.

Further, winter habitat is limited; only 38% of the total big game habitat available within the cumulative effects area of this analysis is winter range. Summer range/parturition areas are also important, because for a period of time, animal movements are limited due to birthing, limited mobility of very young animals, and the increased demand for free water by nursing females. Summer range is much more abundant than winter range; nevertheless, it is important during a critical life stage of these animals.

Effects Specific to Alternatives A & D

No impacts to big game habitat or populations will occur from the implementation of the Alternative A, due to the fact that there would be no oil and gas development permitted on the forest. Similarly, no impacts to big game habitat or populations will likely occur from the implementation of Alternative D, because no surface activity would be allowed on crucial winter range or on key summer/parturition areas. These alternatives would protect 100% of the crucial big game habitats from impacts due to oil and gas development activity.

Effects Specific to Alternatives B, C & D

Some direct loss of foraging and security habitat would occur under all three action alternatives. Provided that the oil and gas disturbance does not exceed levels predicted in the RFDS (1,421 acres of total surface disturbance, which includes 49.5 miles of new road construction), implementation of any of the action alternatives would have a direct impact on <1% of big game winter range or 3% of key big game fawning and calving habitat during the life of this document if all oil and gas activities were to occur in these habitat types. Loss of foraging habitat would be short-term, and in some cases, such as rehabilitation of non-producing well sites, some positive effects would be realized. Loss of security cover would be short-to-long-term. Overall, this level of direct impact would likely result in minor decreases to habitat effectiveness.

Indirect impacts in the form of disturbance and displacement are difficult to predict based on the speculative nature of the RFDS, but are likely to be much more extensive. Indirect impacts due to disturbance are likely to be short-term and of moderate intensity (exploration, development and construction) or long-term and minor to moderate intensity (production and increased access). Of the two production models, directional field development would be the least impacting on big game since facilities would be clustered, wells directionally drilled and activities would be contained within smaller areas (122.5 acres of disturbance with 4.5 miles of new road predicted in RFDS). Conventional field development would be the most impacting because more area would be directly affected (263.1 acres of disturbance), and substantially more roads constructed (12.65 miles of new road), which would increase considerably habitat fragmentation and road avoidance areas.

Based upon development levels predicted in the RFDS, under alternatives B and C road density in critical big game winter range could increase from a pre-lease, forest-wide average of 1.34 miles of motorized road/trail per square mile to 1.40 miles of road per square mile after oil and gas development; this is an increase of approximately 4%. Road density in fawning/calving range could increase from 1.14 miles road/square mile of habitat to 1.83 miles road/square mile habitat; an increase of 61%. Increased access to big game habitat during critical times could affect deer and elk use of these areas (Lyon 1979). This would be particularly true of elk calving areas, which are often selected due to their isolation from human disturbance associated with motorized travel.

Effects Specific to Alternative B

Implementation of Alternative B would subject 646,245 acres of crucial big game winter range (100% of the crucial winter range on the forest) and 45,745 acres of key summer/parturition areas (100% of the key summer areas on the forest) to oil and gas development. Provided that the oil and gas disturbance does not exceed levels predicted in the RFDS (1,421 acres, which includes 49.5 miles of new road construction), implementation of alternative B would likely result in minor decreases to habitat effectiveness on a forest-wide scale, although impacts could result in moderate to major decreases to habitat effectiveness within disturbance distance (600 meters) of infrastructure. Mitigation at the project level would also be necessary to minimize fragmentation of winter habitat and disruption of migratory corridors.

Effects Specific to Alternative C

Implementation of Alternative C would allow oil and gas development on 364,552 acres of crucial big game winter range (59.2% of the crucial winter range on the forest) and 27,018 acres of key summer/parturition areas (61.8% of the key summer areas on the forest).

TL stipulations included in Alternative C would prohibit construction activity during critical periods on all crucial big game winter range and key summer/parturition areas. However, TL would not lessen disturbance to big game that could result from increased road density and access because roads could be constructed outside the TL period and used in subsequent years during critical periods for production as well as by the public. Due to the relatively small proportion of habitat involved, on a forest-wide scale impacts from added roads would be long-term but minor. However, impacts would be moderate on a watershed scale if new roads are added to already densely-roaded areas or to unroaded habitat where security is essential, such as elk calving areas. Year-round maintenance of existing roads normally closed by weather on critical winter range could allow increased public access to these areas, and the resulting disturbance could have a moderate negative impact on local populations due to increased stress and energy demands. Roads and infrastructure associated with oil fields could also fragment big game habitat by interrupting migration and dispersal. Additional mitigation, including off-site habitat restoration, may be required at the project level to off-set deer and elk habitat lost to actions associated with oil and gas development.

Table 3.5-16 Crucial big game winter range and key summer areas subject to oil and gas activity

	ALTERNATIVE			
	A	B	C	D
Crucial big game winter range subject to development (acres)	0	646,244	364,552	0
% of total crucial winter range on forest subject to development	0%	100%	56.4%	0%
Key big game summer/parturition areas subject to development (acres)	0	45,745	27,018	0
% of total key summer/parturition areas on forest subject to development	0%	100%	59.1%	0%

Cumulative Effects

Past, present, and reasonably foreseeable actions in deer and elk habitat include fragmentation from roads; livestock grazing; vegetation changes due to reduced frequency of burning and the increased potential for larger and more intense fires, insect outbreaks, timber harvests and encroachment of climax species; recreation; power-line construction; legal and illegal take; and energy development. There would be no cumulative effects to big game from either alternative A or D, because there would be no incremental effects add to any impacts from past, present or reasonably foreseeable actions.

The incremental affects from alternatives B or C, when added to past, present and foreseeable future impacts would not impact enough habitat to cumulatively push elk populations over a threshold toward decreasing population trends and decreased habitat effectiveness, and away from desired future condition on a forest scale. However, mule deer populations are currently in a declining trend and even minor losses of key habitats added to previous actions could affect herd productivity and hinder recovery of this species. Numerous projects designed to improve habitat conditions and increase habitat effectiveness have been completed on big game winter range. Similar projects are expected to occur in the future, and will be necessary to offset the predicted negative impacts to mule deer from oil and gas development.

Sagebrush Nesters

The three bird species listed below, were selected as MIS during the development of the Forest Plan to represent avian species in sagebrush communities/ecosystems on the FNF. All three species are dependent on sagebrush ecosystems, build nests on the ground or in shrubs, and have similar resource needs; therefore, these species are analyzed together. Diets contain insects, grasses, forbs, seeds and berries. Based on BBS survey data (http://www.mbr-pwrc.usgs.gov/bbs/bbs2010.html), over the past 10 years two of the three MIS species show positive trends in Utah (Brewers, 6.1 and Sage Thrasher, 1.3) with the other species having a slightly negative or stable trend (Vespers sparrow -0.5).

1. Brewer's Sparrow
2. Vesper Sparrow
3. Sage Thrasher

There are approximately 269,715 acres of potentially suitable habitat for sage nesters on the FNF comprised of sagebrush communities. This number was obtained from the Forest vegetation cover map derived from the soil type map. Potentially suitable habitat occurs on all four districts of the FNF.

General Effects

The effects of oil and gas leasing and subsequent development activity on Brewer's sparrow, vesper sparrow and sage thrasher would be direct habitat loss from new roads or facility pads, disturbance, either visual or noise from heavy traffic on existing roads and/or activity at facilities, and habitat fragmentation from facilities, roads and activity within previously continuous habitat.

Effects Specific to Alternative A

No impacts to sagebrush nesting MIS birds or habitat would occur from the under Alternative A, due to the fact that there would be no oil and gas development permitted on the FNF.

Effects Specific to Alternatives B, C, D

Effects from any of the three action alternatives are similar. Migratory birds, and sagebrush nesters in particular, are most vulnerable to disturbance ("take") while nesting because nests are often inconspicuous and close to the ground. Oil and gas activities could cause direct impacts ("take") to any undetected migratory bird nests. Noise impacts related to oil and gas activities around nesting birds may also cause nest abandonment. Migratory bird species differ in their sensitivity to noise, but oil and gas activities within a 100-200 foot radius of nests could result in take due to direct stress or the masking of predator arrival or associated alarm calls (Slabbekoorn and Ripmeester 2008). While these impacts may affect individuals, under the predicted level of development (see RDFS), oil and gas activity would not be in proximity to enough migratory bird nests to affect populations and impacts due to noise would be minor, incidental, and short-term. Pre-construction surveys may be conducted for sagebrush nesters and other migratory birds of concern before the location of oil and gas activities is finalized; however, surveys are not required under the Migratory Bird Treaty Act.

Outside the breeding season, direct and indirect impacts to sagebrush nesting birds would be generally short-term and of negligible intensity. There would be some loss of foraging habitat due to direct loss and disturbance, but there would be no effect on migratory bird populations because this type of habitat is abundant and birds are mobile and readily use alternate foraging sites.

Of the three action alternatives, impact to sagebrush nesters would likely be greatest under Alternative B because it allows oil and gas development on the largest amount of sagebrush habitat. Alternative D would subject the least amount of potential habitat to development. Alternative C is between B and D. Table 3.5-17 displays the number of acres subject to oil and gas activity and percentage of the total habitat type open for development. Stipulations applied to greater sage-grouse accounts for the largest differences between the amount of habitat open to development among the three action alternatives, and since sagebrush nesting migratory birds occupy the same habitat types they would benefit to some degree from these measures.

Table 3.5-17 Potential sagebrush nesting MIS bird habitat subject to oil and gas activity

	ALTERNATIVES			
	A	B	C	D
Potential habitat open for development (acres)	0	269,715	167,685	13,545
Percent of total potential habitat subject to development	0%	100%	62.2%	5%

Cumulative Effects

There would be no cumulative effects to sagebrush nesting MIS birds from Alternative A, because there would be no incremental effects would add to any impacts from past, present or reasonably foreseeable actions. The incremental effects from any of the action alternatives (B, C & D), when added to past, present and foreseeable future impacts, would not cumulatively push sagebrush nesting MIS birds over a threshold which would result in a trend away from desirable condition. Therefore, when the impacts from the proposed leasing and subsequent oil and gas development are added to past, present and foreseeable actions, the cumulative effects will not result in a trend away from the desired condition.

Cavity Nesters

Cavity Nesters are MIS that represent species dependent on tree cavities for portions of their life cycle. Species selected include:

1. Harry Woodpecker
2. Western Bluebird
3. Mountain Bluebird

There are approximately 434,166 acres of potentially suitable habitat for cavity nesters on the FNF. Potentially suitable habitat occurs on all four Ranger Districts. There is limited data from which to determine trends in populations of these species on the Forest, however, all have exhibited stable or slightly increasing trends state-wide over the past 10 years (Sauer 2011). Guidelines for snag retention designed to maintain habitat effectiveness for these species are written into the Forest Plan (Appendix CC – Fishlake Forest Plan pg. CC-40) and are incorporated for all proposed actions.

Table 3.5-18 Forest Plan guidelines for snag retention for cavity nesters

COVER TYPE	MINIMUM SNAGS/ 100 ACRES	MINIMUM PREFERRED SIZE
Ponderosa Pine	200	18" dbh <-->30 feet tall
Mixed Conifer and Spruce/Fir	300	18" dbh <-->30 feet tall
Aspen	200	8" dbh <-->15 feet tall
Lodgepole and Aspen/Lodge	300	8" dbh<-->15 feet tall

General Effects

The effects of oil and gas leasing and subsequent development activity on hairy woodpecker, western bluebird and mountain bluebird would be direct habitat loss, especially the loss of cavity nesting trees, from new roads or facility pads, disturbance, either visual or noise from heavy traffic on existing roads and/or activity at facilities, and habitat fragmentation from facilities, roads and activity within previously continuous habitat.

Effects Specific to Alternative A

No impacts to cavity nesting MIS birds or habitat should occur from the implementation of the No Action alternative, due to the fact that there would be no oil and gas development permitted on the forest.

Effects Specific to Alternatives B, C, D

Effects from any of the three action alternatives (B, C & D) are similar and have been grouped here for analysis. Of the three action alternatives, Alternative B would subject the most (100%) amount of potential cavity nesting bird habitat to oil and gas development, and alternative D would subject the least amount (4%) of potential habitat to development. Alternative C (50%) is between B and D. Table 3.5-19 lists out the number of acres subject to oil and gas activity and percentage of the total habitat type open for development.

Table 3.5-19 Potential cavity nesting MIS bird habitat subject to oil and gas activity

	ALTERNATIVES			
	A	B	C	D
Potential habitat open for development (acres)	0	434,166	215,666	16,613
% of total potential habitat subject to development	0%	100%	49.7%	3.8%

Cumulative Effects

There would be no cumulative effects to cavity nesting MIS birds from Alternative A, because there would be no incremental effects which would add to any impacts from past, present or reasonably foreseeable actions.

The incremental affects from any of the action alternatives (B, C & D), when added to past, present and foreseeable future impacts, would not cumulatively push cavity nesting MIS birds over a threshold which would result in a trend away from desirable condition. Past and present projects, which affect forested vegetation types, have all included stipulations on snag retention; therefore, adverse impacts to cavity nesting MIS birds have been reduced. Therefore, when the impacts from the proposed leasing and subsequent oil and gas development are added to past, present and foreseeable actions, the cumulative effects will not result in a trend away from the desired condition.

Riparian Nesters

The four bird species listed below were selected as MIS to represent bird species dependent on riparian habitat areas during the breeding season. These species all rely on diverse, healthy stands of riparian vegetation for habitat, and are therefore analyzed together.

1. Lincoln's Sparrow
2. Song Sparrow
3. Yellow Warbler
4. MacGillivray's Warbler

Lincoln's sparrow has been detected at numerous transect locations on the forest during avian surveys over the last 10 years. In addition to these data, Breeding Bird Surveys conducted in Utah have detected Lincoln's sparrows and indicate an increasing trend statewide for this species (Sauer et al 2011).

Song sparrows have been detected at numerous transect locations on the forest during avian surveys over the last 10 years. They are fairly common in healthy riparian habitat on the FNF. In addition to these data, Breeding Bird Surveys conducted in Utah have detected song sparrows and indicate a stable to slightly increasing trend statewide for this species (Sauer et al 2011).

Yellow warblers have been detected at numerous transect locations on the FNF during avian surveys over the last 10 years. They are one of the most common passerines in riparian habitat on the FNF. In addition to these data, Breeding Bird Surveys conducted in Utah indicate a stable to slightly increasing trend statewide for this species (Sauer et al 2011).

Surveys for MacGillivray's warbler on the forest have been limited, nevertheless, individuals have been detected on the Richfield Ranger District and they likely occur on the other three districts, as they are a fairly common species in riparian habitat adjacent to shrublands on the FNF. Breeding Bird Surveys conducted in Utah indicate an increasing trend statewide for this species (Sauer et al 2011). There are approximately 14,946 acres of potentially suitable habitat for riparian nesting avian species on the FNF. Potentially suitable habitat occurs on all four Ranger Districts.

General Effects

The effects of oil and gas leasing and subsequent development activity on Lincoln's sparrow, song sparrow, yellow warbler, and McGillivray's warbler would be direct habitat loss from new roads or facility pads, disturbance, either visual or noise from heavy traffic on existing roads and/or activity at facilities, and habitat fragmentation from facilities, roads and activity within previously continuous habitat. Compared to other migratory bird habitat types on the forest riparian habitat is limited, also, riparian habitats are connected in a linear fashion. Therefore, adverse effects to riparian habitat tend to be particularly detrimental to riparian nesting birds. Site-specific NEPA analysis at the APD and field development levels should stipulate forest guidelines for riparian protection on a project specific basis.

Effects Specific to Alternative A

No impacts to riparian nesting MIS birds or habitat will occur under Alternative A, due to the fact that there would be no oil and gas development permitted on the forest.

Effects Specific to Alternatives B, C & D

Effects on riparian nesting MIS birds from any of the three action alternatives (B, C & D) are similar; there may be negligible adverse impact on habitat effectiveness, but will not likely result in a trend away from the desired condition. Of the three action alternatives, Alternative B would subject the most potential riparian nesting habitat (14,946 acres or 100%) to oil and gas development. Table 3.5-20 lists out the number of acres subject to oil and gas activity and percentage of the total habitat type open for development.

Table 3.5-20 Potential riparian nesting habitat open to long-term development subsequent to leasing

	ALTERNATIVE			
	A	B	C	D
Potential habitat open for development (acres)	0	14,946	2,882	33
% of total potential habitat subject to development	0%	100%	19.3%	0.2%

Cumulative Effects

There would be no cumulative effects to riparian nesting MIS birds under Alternative A, because there would be no incremental effects which would add to any impacts from past, present or reasonably foreseeable actions.

The incremental affects from any of the action alternatives (B, C & D), when added to past, present and foreseeable future impacts, would not cumulatively push riparian nesting MIS birds over a threshold which would result in a trend away from desirable condition.

Dixie National Forest Management Indicator Species

The following seven species are MIS for the Dixie National Forest based on the current LRMP. The Teasdale portion of the Fremont River District is managed by the FNF, but is part of the Dixie National Forest and is therefore covered under the Dixie LRMP. Therefore, the following species are discussed for the Teasdale portion of the Fremont River District. Detailed information on species life histories and status on the Dixie National Forest can be obtained from Life History and Analysis of Endangered, Threatened, Candidate, Sensitive, and Management Indicator Species of the Dixie National Forest (Rodriguez 2008), and is herewith incorporated by reference.

Northern Flicker

Breeding Bird Surveys over a 30-year period (1968 – 1998) in Utah show that statewide flicker populations are stable. According to Parrish et al. (2002), Utah has a very low importance to this species, meaning less than 1% of the species' total breeding distribution is in Utah. Avian surveys on the Teasdale portion of the Fremont River District have detected an abundance of northern flickers. Based on surveys since 1986, flickers have increased in number on the forest. There is currently about 1 flicker for every 16.6 acres forest-wide.

Potentially suitable habitat for this species includes limber pine, ponderosa pine, aspen, pinyon/juniper, Gamble oak, spruce/fir, and mixed conifer dominated habitats. This includes some 153,611 acres of potential habitat on the Teasdale portion of the Fremont River Ranger District.

General Effects
Indirect impacts of human activity and noise have negligible impacts on northern flicker. Direct habitat loss due to well pads and new roads will reduce flicker habitat. However, because northern flickers are more habitat generalist and occur in a wide range of habitat types this species is well distributed across the FNF.

Effects Specific to Alternative A
No impacts to northern flicker individuals or habitat will occur from the implementation of the No Action alternative, due to the fact that there would be no oil and gas development permitted on the Teasdale portion of the Fremont River District.

Effects Specific to Alternatives B, C, D
Effects from any of the action alternatives (B, C or D) will not likely result in changes to current population trends. Table 3.5-21 lists the total acres of potential flicker habitat open to oil and gas development by alternative, as well as the percentages of flicker habitat over the total number of acres of flicker habitat on the Teasdale portion of the Fremont River District. However, northern Flickers are more habitat generalists, and are fairly resistant to human disturbance, therefore, even if the entire predicted RFDS oil and gas activities (1,421 Acres) occurred on the Teasdale portion of the Fremont River District it would only impact 0.9% of the potential habitat on the district. Northern flickers would not likely be displaced from the development activities.

Table 3.5-21 Potential flicker habitat open to long-term development subsequent to leasing

	Alternative			
	A	B	C	D
Potential habitat open for development (acres)	0	153,611	94,507	2,553
% of total potential habitat subject to development	0%	100%	61.5%	1.7%

Cumulative Effects
There would be no cumulative effects to northern flicker from Alternative A, because there would be no incremental effects which would add to any impacts from past, present or reasonably foreseeable actions. The incremental impacts from any of the action alternatives (B, C, or D), when added to past, present and foreseeable future impacts, would not cumulatively push northern flicker over a threshold which would result in a decreasing trend away from the desired condition.

Wild Turkey

There is 94,312 acres of potential wild turkey habitat on the Teasdale portion of the Fremont River Ranger District. Potential habitat includes ponderosa pine, mountain brush, mixed conifer, aspen, and fir dominated vegetation types. Both Merriam's and Rio Grande subspecies of wild turkey occur on the Teasdale portion of the Fremont River Ranger District. Wild turkey populations are hunted on the district by permit issued by the UDWR. Population trends are stable to increasing (Rodriguez 2008, Bonebrake 2007, UDWR 2010a).

General Effects

Wild turkeys are tolerant of low levels of human activity (e.g. farming operations), but are more sensitive to higher levels of human disturbance. It is not known what the human activity threshold is; it may not be possible to set a level due to the complexity of confounding factors in the environment. However, it is clear that the period of oil or gas development would be the most disruptive to wild turkey, and the production phase would be less disturbing. Direct impacts would consist of loss of habitat within the footprint of the well pad, road and facilities development. Indirect impacts would consist of disturbance and displacement around human activities. The displacement/disturbance distance of wild turkey from oil and gas activity has not been studied. However, based on practical knowledge of wild turkey around farming machinery and operations, the disturbance distance is short and based on visibility through ground cover. Wild turkey hens are the most susceptible to disturbance while nesting. Once flushed from a nest, they often abandon the nest and may re-nest elsewhere.

Effects Specific to Alternative A

No impacts to wild turkey individuals or habitat will occur under Alternative A, due to the fact that there would be no oil and gas development permitted on the Teasdale portion of the Fremont River District.

Effects Specific to Alternatives B, C, D

Table 3.5-22 lists the total acres of potential wild turkey habitat open to oil and gas development by alternative on the Teasdale District, as well as the percent of the total turkey habitat on the Teasdale District open to oil and gas development by alternative. The primary factor affecting a difference between the alternatives is the 300 foot NSO buffer in alternative C and the 500 foot NSO buffer in alternative D. Wild turkeys rely heavily on riparian areas; therefore any protection measures to riparian habitat will benefit wild turkeys. There may be some minor displacement of wild turkey around oil and gas facilities during the construction phase. This displacement would be temporary (during construction when human activity is the highest).

Table 3.5-22 Potential wild turkey habitat subject to oil and gas activity

	ALTERNATIVE			
	A	B	C	D
Potential habitat open for development (acres)	0	94,312	79,639	2,147
% of total potential habitat subject to development	0%	100%	84%	2.3%

Cumulative Effects

There would be no cumulative effects to wild turkey under Alternative A, because there would be no incremental effects which would add to any impacts from past, present or reasonably foreseeable actions.

The incremental impacts from any of the action alternatives (B, C, or D), when added to past, present and foreseeable future impacts, would not cumulatively push wild turkey over a threshold which would result in a decreasing trend away from the desired condition, or change the State's ability to issue hunting permits for this species in this area.

Other Species of Concern

Migratory Birds

Migratory birds are protected under the Migratory Bird Treaty Act, which oil and gas activities are required to comply with under SLT&C. Executive Order 13186 of January 10, 2001 provides broad guidelines to federal agencies on migratory bird conservation responsibilities. To implement the provisions of the Executive Order, the Forest Service and U.S. Fish and Wildlife Service (USFWS) developed an Interagency Memorandum of Understanding (MOU) for the conservation of migratory birds. In compliance with the MOU, selected priority bird species of concern are identified and addressed in this document. In addition the Forest Service and the US Fish and Wildlife Service developed a strategy for working through the MBTA process.

Effective management of avian communities depends on identifying the species and habitat most in need of conservation efforts. Partners in Flight (PIF) used a ranking system to identify priority species for conservation action in Utah. The PIF priority species list is used as a tool by federal and state agencies to assist in the prioritization of bird species that should be considered for conservation action (Parrish 2002).

The Mexican spotted owl, greater sage-grouse, Brewer's sparrow, yellow-billed cuckoo and three-toed woodpecker were selected as species of concern from the priority species list. These species represent cliff, shrub-steppe, high desert scrub, lowland riparian and conifer habitat on the Forest. Life History Information on these species can be found in Life History and Analysis of Endangered, Threatened, Candidate, Sensitive and Management Indicator Species of the Fishlake National Forest (Rodriguez 2006). This citation is incorporated here by reference. Analysis of effects to these species is documented in the sections above.

3.6 UNROADED/UNDEVELOPED

3.6.1 Affected Environment

In 2000, discussions began on a joint effort between the FNF and the Dixie National Forest to begin the process to revise their respective Forest Land and Resource Management Plans. The Dixie National Forest became a partner in the planning process and the Notice of Intent to begin the revision was filed in 2002 in the Federal Register 67(90)31761 for the Dixie and 67(90) 31178 for the Fishlake. The Planning Rule(s) were enjoined by the courts as not being sufficient and thusly, the revision process was not completed.

As part of the defunct revision process, Undeveloped Area Evaluations (UAE) were initiated to inventory any other unroaded/undeveloped lands that existed beyond the Roadless Area Review Evaluation (RARE) II (1979) and National Forest Management Act inventories that were completed in 1983. Directions for the UAE inventory were outlined in the "Intermountain Region Planning Desk Guide: A Protocol for Identifying and Evaluating Areas for Potential Wilderness" (USDA 2004). Questions and a Data Dictionary for the inventory were created by the planning team based upon Forest Service Handbook 1909.12 Chapter 7 (the desk guide has subsequently been replaced with Forest Service Handbook 1909.12(70) dated 1/31/2007.) This protocol considered only known classified road system roads, not including classified roads used for administrative purposes only. Therefore, it identified areas as Unroaded and Undeveloped that currently contain numerous constructed, but not classified roads and motorized trails, as well as timber harvest areas, powerlines, minor recreation sites and other infrastructure.

Undeveloped and Unroaded Areas (UUA) inventoried in the draft UAE under the halted Forest Plan process (circa 2006) have not, and do not, hold any sort of legal status for protection from development. Conversely, the protection or management of Inventoried Roadless Areas (IRA) has varied over the years due to the effects of the 1984 Utah Wilderness Act which released these lands in Southern Utah until Forest Plan Revision (see 111-3, #10) and the Roadless Area Conservation Rule (RACR) which is now in effect.

Status concerning the implementation of the RACR has changed considerably over the last eleven years. Since 2001 the RACR has been the subject of numerous lawsuits in the Federal District Courts of Idaho, Utah, North Dakota, Wyoming, Alaska, the District of Columbia and California. Soon after being reinstated in February of 2007 in Federal District Court, State of California v. USDA, it was again enjoined in August of 2008 in Federal District Court for the District of Wyoming. P On May 30, 2012, Sec. of Agric. Mem. 1042-156 requiring review and approval of certain activities in Roadless Areas expired. Presently, the FS Chief continues to review certain activities planned in roadless areas to ensure a consistent approach to implementation of the 2001 Roadless Rule. Refer to “Chief’s Review Process for Activities in Roadless Areas” in the project record. Of particular importance to maintaining “roadless” character, road construction and reconstruction would not be allowed in IRAs.

In regard to the UUAs determined in the Draft UAE; Forest Service obligation to inventory these additional tracts under the Forest Plan Revision process is, however, mandatory as initiated as part of the Fishlake and Dixie National Forest’s yet uncompleted revision. At this time, the Forest Service is on “hold” as it awaits the new planning rule. This draft UAE benefits the public in providing for review and recommendations concerning potential wilderness areas where appropriate under the Forest’s forthcoming Forest Plan Revision. The UAE is a draft inventory which has not yet been trued on the ground. This draft inventory largely incorporated GIS process using existing coverage in the database. Many of these UUAs contain a number of intrusions or “cherry-stemmed” roads which generally affect potential wilderness character.

3.6.2 Environmental Consequences

General Effects to Unroaded and Undeveloped Areas
Possible effects to Undeveloped/Unroaded Areas are the loss of acres to development of oil and gas activities, along with associated roads, further dissecting and segregating areas into smaller parcels. UAE parcels may not be suitable for wilderness potential by becoming smaller than 5000 acres. However, smaller parcels may be linked to IRA and still have value for potential wilderness areas. It is not possible to calculate how and where this may occur as the Reasonably Foreseeable Development Scenario (RFDS) is not site-specific. NEPA analysis at the time of the Application to Permit Drilling on a leased parcel will be necessary to determine actual effects to a given Undeveloped and Unroaded Area in the Draft UAE.

Effects to Unroaded and Undeveloped Areas by Alternative

Alternative A
This is the no action alternative; therefore no direct or indirect effects will occur to Undeveloped and Unroaded Areas in the Draft UAE.

Alternative B
This alternative proposes to lease the entire forest. Direct effects would be oil and gas activities possibly fragmenting those areas in the UAE into smaller tracts. Primitive Recreation potential could be reduced, as well. Table 3.6-1 shows the amount of UAE that would be affected by stipulation. The NL and NSO portions of the areas demonstrate no effect, but CSU, LN and SLT&C imply that oil and gas activities could occur on a given parcel of land. Duration of the oil field development could likely last 30 years. Once the field is played out, the tracts and roads, covered under bond, would be reclaimed. Indirect effects could be the possibility of increased traffic into a remote area, thus further degrading primitive recreation experience potential.

Alternative C
This alternative proposes to lease the entire forest, but with stricter environmental controls. Although the Standard Lease Terms and Conditions provide for significant protection of resources, this alternative employs stipulations that puts a much greater portion of the Fishlake NF into NSO status.

Direct and Indirect effects would be the same as Alternative B, though on a reduced scale. See Table 3.6-1.

Alternative D
This alternative proposes the largest portion of the forest into No Lease (NL) and is the most restrictive of all the alternatives in terms of actual oil and gas activity siting potential, with only 3.5% of the Fishlake NF available for ground disturbing activity, i.e. roads and well pads.

Direct and Indirect effects would be the same as Alternative B, though on a vastly reduced scale. Table 3.6-1 shows Draft UAE acreage. Maps and lists of individual areas are presented in the Specialist's Report for UUA.

Table 3.6-1: Acreage and how each alternative affects the UUA by stipulation

Stipulation	Alternative A	Alternative B	Alternative C	Alternative D
NL	1,083,779	0.0	0.0	921,439
NSO	0.0	0.0	935,772	144,222
LN/TL	0.0	0.0	10,740	0.0
LN	0.0	798,061	11,754	3,378
CSU/TL	0.0	0.0	46,922	0.0
CSU	0.0	115,329	45,542	4,660
SLT&C/TL	0.0	0.0	14,776	0.0
SLT&C	0.0	170,389	18,273	10,080
Non-FS	3	3	3	3
TOTAL	1,083,782	1,083,782	1,083,782	1,083,782

Cumulative Effects

The RFDS proposes 1,421 acres of gross disturbance over the next 15 year period, with 350 acres left in actual road and well field production. The rest of the acreage would be reclaimed and restored to a natural condition. When combined with past, present and reasonably foreseeable future actions, there could be long term (~30 years) impacts that could be seen. However, most, if not all actions could be implemented alongside oil and gas operations. Some recreational activities could benefit from improved road access.

3.7 VISUAL AND SCENIC INTEGRITY

3.7.1 Affected Environment

The primary issue associated with scenic resources is the degree of visible change that may be evident in characteristic landscapes, viewsheds, and areas with high scenic value. Activity or development associated with oil and gas leasing or exploration could adversely impact the form, line, color, and texture in the surrounding environment, and thereby impact scenic quality. The extent of noticeable change to the visual landscape as a result of leasing or exploration can be measured in the visual contrast or dominance of associated unnatural elements.

Strong contrast occurs where activities would attract attention and dominate the landscape setting. Where activities are noticeable and start to dominate the setting moderate contrast occurs. Contrast is weak where oil and gas activities would be noticeable yet would not attract attention and be subordinate to the setting.

Oil and gas exploration activity with the highest potential to adversely affect scenic quality on lands managed by the FNF is road construction/reconstruction. Lighting associated with the drill rigs could also affect the aesthetics of surrounding areas within sight of the activity.

Inventoried Scenic Integrity Objectives have been established during recent Forest Plan revision, and consistency with these could be affected. Lands managed by the FNF have been inventoried for their scenic quality and associated sensitivity, and classified into one of four SIO classes; Very High, High, Moderate, and Low.

Very High, High and Moderate are the most sensitive SIO classes that could be impacted by oil and gas activity. A Very High SIO allows for ecological changes only, management activities of any duration, except for very low impact recreation facilities, are prohibited. The other two, High and Moderate allow for activity, yet are sensitive to changes in the landscape. Oil and gas activity within middle or foreground distance zones in High areas, or the foreground distance zone in Moderate areas would most likely not meet objectives for managing scenic quality if associated effects remain for more than a reasonably specified duration. For High this means all activities to restore the area to a naturally appearing condition should be accomplished either during the operation or immediately after. For Moderate, this activity should be accomplished as soon after project completion as possible, or at a minimum, within the first year.

Low covers areas that have experienced a relative amount of human alteration. Thus, oil and gas activity would be allowed in these areas with less restriction. However, activities involving vegetative and landform alteration must borrow from naturally established form, line, color, or texture so completely and at such a scale that their visual characteristics are those of natural occurrences within the surrounding area or character type.

In summary, in relation to oil and gas exploration, a Very High SIO would not be met in most any case and a Low SIO would accommodate a reasonable level of activity without additional mitigation. Moderate, and most particularly High SIO classes, would likely need additional mitigation measures, even when applying Standard Lease Terms and Conditions, to meet SIO guidelines.

3.7.2 Environmental Consequences

General Effects to Visual and Scenic Integrity
In the short term, oil and gas leasing activity or exploration could immediately increase contrasts of form, line, color, or texture. Visual evidence of any new access roads, including existing roads that are reconstructed or improved could become particularly apparent. Due to the attributes of line, relative scale and color these contrasting linear elements often remain very noticeable or dominant until subsequent and successful re-establishment of vegetation.

Structures typically have adverse visual impact; particularly from unnatural silhouette effect when located at the skyline or set against a background of snow. Vertical structures are very apparent from great distances, particularly if in silhouette or relatively horizontal landscapes.

Given the number and scale of the potential leases it may not be practical to hide all of the facilities associated with oil and gas development solely to preserve scenic integrity. However, particularly in more sensitive views, some facilities or any associated utilities or equipment could be strategically located, buried, screened or otherwise camouflaged. This would especially assist views as seen from nearby communities or areas important to tourism and from important travel corridors or highways.

From the perspective of the casual Forest visitor: Views from major travel corridors or viewpoints of areas not having surface development would not be affected to any level of dominance in the long term, particularly given adequate mitigation. Generally, views involving structures, utilities, etc. possess sufficient variety in color, form and texture so as to preclude any long term dominant visual impact if sensitively designed. Direct or indirect benefit (shadow effect) resulting from the irregular or uneven topography of most areas would also assist in camouflaging lease related effects.

A majority of the scenically sensitive areas with potential for lease would not be seen while traveling in both directions on important routes or from the National Park or major communities. They are either not available for lease or are effectively screened by topography so as not to be readily apparent in linear view for an extended duration as seen by travelers.

If sensibly located, appropriately designed and mitigated; it is generally anticipated that any reasonable level of exploration related activity associated with this proposed complex of leases would meet appropriate Scenic Integrity Objectives in both the intermediate and longer terms.

Effects to Visual and Scenic Integrity by Alternative

Alternative A
Present viewsheds and their determined Scenic Integrity Objectives would not be altered by development or activity associated with oil and gas leases. Generally, changes would be shaped primarily by natural events: Scenery would be subject to cyclical, natural disturbance processes such as fire, wind, drought and vegetative succession.

Alternately, present views of existing development, roads, etc., possibly incorporated or reconstructed to facilitate leasing activity; would not be potentially benefited by implementation of recommended mitigation associated with oil and gas leases.

Alternative B
Of the four alternatives, Alternative B has the greatest potential to adversely affect scenic resources.

For this alternative, a High SIO (collectively 58%) applies to a majority of acres with potential visual impact, and a Moderate SIO (41%) applies to the rest of the acres possibly affected. Due to the relatively large number of potentially affected acres classified under these two more stringent SIOs, there is a good chance that oil and gas leasing activity would impact high quality scenic resources for a time until the successful completion of appropriate mitigation.

However, this potential for adverse effect needs to be taken within overall context. In general, particularly within ecological time-frames, oil and gas leasing is expected to have relatively minor effect to scenic resources. Disturbance would be short-term and related to exploration activity which should be fully mitigated upon successful mitigation.

Temporary visual effects could result primarily from road construction and reconstruction which commonly exhibits apparent contrast in line, color and form. The strong visual contrast resulting from well pad and associated access road construction could be evident from certain viewpoints and may attract enough attention to dominate the surrounding natural landscape. Again, this contrast would be short-term; however, as well pads and access roads are to be reclaimed following exploration activities.

Alternative C
For this alternative, the type of effects related to oil and gas leasing activity would be similar to alternative B, yet at a reduced scale. The amount of potentially visually impacted acres of High SIO (again taken collectively) and Moderate SIO are split at almost 1:2. There is a moderate chance that leasing activity would impact highly scenic resources until mitigation/reclamation is complete. This is especially the case given the large amount of visually sensitive acres under a NSO stipulation in this alternative, which accordingly would not even potentially contribute to any indirect or secondary visual effect -- as when activity or associated development is seen from adjacent visually sensitive areas.

Alternative D
Alternative D has the least potential for negative effect to scenic resources of all of the action alternatives. It is determined that only a negligible 4% total acres could potentially be directly

impacted visually -- all of Moderate SIO. Under this SIO, oil and gas related activity may be evident but not become dominant as was explained in detail earlier in this report.

Cumulative Effects
There is ample evidence of human modification throughout the area associated with potential leases. Past, present and reasonably foreseeable future projects or development have and will contribute to unnaturally appearing line, texture and form in the potentially leased area. Existing roading in particular typically leaves a long-term effect upon the scenery of the area.

3.8 SOILS, GEOLOGIC HAZARDS, AND STEEP SLOPES

3.8.1 Affected Environment

Generally speaking, soil resources usually consist of a relatively thin, unconsolidated layer of mineral type horizons that are located upon the earth's crust. Some soils have distinct accumulations of humified organic matter occurring at the ground surface. The soil profile usually acquires its unique properties as a direct result of physical and chemical weathering along with the biological alteration of its geologic source materials; in addition, the actual process of soil formation includes a contribution by factors such as climate and topography along with the simple recognition – that, all soils continue to form over time.

Since 1984, the FNF has been a partner with both the USDA - Natural Resources Conservation Service (NRCS) and the Utah Agricultural Experiment Station (UAES) on the action of conducting soil survey investigations throughout south-central Utah. The actual soil mapping and related ground sampling activities fall under the direction and specification of two MOUs between these agencies. These documents allow the Forest Service to perform soil analysis on 1.45 million acres of public lands located in Sevier, Wayne, Juab, Millard, Beaver, Piute, Sanpete, Garfield and Iron counties. Currently the FNF is involved in managing the land resource inventories for two rather substantial geographic areas; these National Cooperative Soil Survey (NCSS) projects are identified as follows:

Tushar - Pahvant - Canyon Soil Survey Area # 649 includes 768,830 acres of NFS lands, located on the Fillmore and Beaver Ranger Districts. The field mapping on this survey project was finished by the FNF during the fall of 1989. A final quality control review was completed in cooperation with the Forest Service, the NRCS, Utah State Office Soils Staff and members from their NRCS South National Technical Center in Ft. Worth, Texas during May of 1990. The soil survey report is currently in a DRAFT format; however, there are no plans for its publication at this time. Land resource information obtained during the field mapping activities and acquired from the data collection phase of this project has been used to develop numerous Geographic Information System (GIS) interpretive displays using the new ArcView (3.3) software package. All of the Data Map Units (DMUs) and Pedon Descriptions (PDs) for this project have been entered into the USDA – NRCS National Soil Information System (NASIS) Database and have been checked, corrected and validated for this survey area by consultants Terra West Consulting of St. George, Utah.

The Forest Service Handbook (FSH 2550 – R4 Supplement, March 2011) states: "... presently, at least 85 % of the total acreage occurring within an activity area must have soil properties that remain in satisfactory condition. In this particular instance, the term activity area is not to be confused with all NFS lands currently being administered by the FNF. Plans for projects where treatments are expected to cause resource damage, exceeding the maximum thresholds listed under the R4 Soil Quality Standards, must include provisions for mitigation of the ground disturbances.

Fremont – Monroe - Salina Soil Survey Area # 651 includes 685,549 acres of NFS lands located on the Loa and Richfield Ranger Districts. This survey is considered to be an on-going project at the current time. Currently, all of the field mapping has been completed, and about 90 to 95 percent of the supporting documentation has been collected by professional soil scientists. All of the soil polygons were digitized into the FNF GIS during 1995 - 1997. Land resource information obtained from the field mapping activities and acquired during the data collection phase of this project has been used to develop numerous interpretive displays in GIS. Themes were prepared related to geologic hazards, unique soil properties, wind erosion, water erosion, hydrologic groups, soil loss tolerance, aspen regeneration, broadcast seeding, topsoil thickness, soil reaction, puddling, compaction, subsidence, water retention, moisture regimes, temperature regimes, reforestation, windthrow hazards, and unstable slopes.

Five categories of geologic hazards and soils conditions were identified as concerns for Oil and Gas project activities:

1. North Horn Formations coupled with greater than 25% slopes
2. Very steep terrain (slopes greater than 35%)
3. Wetland areas with hydric soils
4. Puddling and compaction
5. Unstable sites which include soil creep, minor slumps, and landslide areas

3.8.2 Environmental Consequences

General Effects to Soils, Geologic Hazards and Steep Slopes
When the ground is disturbed by constructing various size pads (exploration, facilities, production, or water injection), building new roads, re-conditioning existing transportation surfaces, erecting powerlines and piecing together pipelines, a certain amount of damage is going to occur to the affected soil material. According to the RFDS a gross disturbance of 1,421 acres has been predicted for the FNF. However, the net disturbance for our development scenario has been reduced down to about 350 acres after the lessee reclaims the exploration wells, obliterates the abandoned roads and reduces the size of the production pads. A few areas will sustain resource damage that adversely affects long-term soil productivity. Most of the problems will be associated with 1) displacement in the form of wind and water erosion, 2) mass movement in the form of slumping and landslides, 3) soil deformation in the form of detrimental puddling and compaction and 4) the amount of protective ground cover remaining within our exploration and production areas.

It would be essential to monitor for any disturbance connected with oil and gas exploration. The RFDS indicates 20.6 miles of new road would be used for production activities. Road surfaces can be very erosive in first and second years, and continue to be problematic in any (and all) years the transportation surface remains in use.

In order to minimize the amount of environmental consequence upon the soil resource the FNF drafted a set of “Oil and Gas Construction and Operating Standards plus Well Site Design Requirements” in May of 2007. These operating standards have been developed to help operators meet agency and Forest requirements when preparing their SUPO; this document assures overall consistency is being met with Forest Service management objectives and LRMP direction.

Effects to Soils, Geologic Hazards and Steep Slopes by Alternative

Alternative A
The FNF would not allow commercial interests to acquire leases related to oil and gas production on NFS lands. Therefore, no impacts to soils or geologic hazards from oil and gas activities would be possible.

Alternative B
Under the general requirements of Alternative B, all five potential issues associated with geologic hazards and soil resources would be managed under SLT&C.

According to the SLT&Cs the lessee must conduct operations in a manner that minimizes adverse impacts to the land, air and water to cultural, biological, visual and other resources. Prior to disturbing the surface of the leased lands, the lessee must contact the lessor, to be appraised of procedures to be followed and modifications or reclamation measures that may be necessary. Areas to be disturbed may require inventories or special studies to determine the extent of impacts upon the resources. ”

While the USDI-Form 3100-11 mentions the need to protect various resources and discusses land use responsibilities, it is not specific enough to protect soils with displacement issues, puddling, and compaction, accelerated rates of erosion, and ensure an adequate amount of new vegetation plus protective ground cover to stabilize valuable topsoil deposits.

Alternative C
This alternative adds specific stipulations to the requested oil and gas leases. Potential land issues associated with geologic hazards and very steep slopes were placed under the NSO stipulation due to risky terrain. Specifically, the SLT&C of Alternative B were deemed insufficient to adequately protect the soil resource according to the public interest.

There are 52,487 acres of fragile soils derived from unstable, clayey sediments of the North Horn Geologic Formation occurring on upland, mountain and high mountain landscapes. These are located in areas measuring > 25 % slope, steep sites which should be avoided to protect the resource. Secondly, there are 492,327 acres of NFS lands located on very steep (>35%) terrain. These are problematic locations having erosive soils requiring avoidance to insure that proposed leasing activities do not cause landslides or trigger the renewed movement of existing slumps, which in turn could threaten existing roads and production facilities.

Although somewhat limited in overall extent, there are 156 acres of unstable land previously affected by landslides, minor slumps, soil creep, rockfalls and avalanches. Most of these disturbances were connected with the extreme spring snowmelt conditions of 1983 and 1984.

Under this alternative, these lands have been placed under the CSU stipulation for oil and gas leasing.

Puddling, compaction and wetlands will be addressed with a LN as a form of guidance for the lessee to consider when submitting a SUPO. There are 87,420 acres of clayey soils located on the FNF. These are sites which are susceptible to deformation in the form of puddling and compaction disturbances. To a lesser extent, there are 5,029 acres of NFS lands that actually qualify for wetlands containing hydric soils. The FNF will make a full disclosure of these fragile locations to the lessee under a lease notice. Alternative C affords moderate resource protection to potential geologic hazards and soil resources on 637,419 acres of NFS lands.

Alternative D

Alternative D adds even more restrictive stipulations to the proposed leasing activities. In order to achieve maximum resource protection, wetlands are grouped together with geologic hazards and very steep slopes under the NSO stipulation. In addition, all soils derived from North Horn sediments (97,570) acres are placed under NSO protection.

Stipulations on unstable lands (CSU) and guidance on puddling and compaction (LN) disturbances remain consistent with Alternative C. Alternative D affords resource protection to potential geologic hazards and soil resources on 665,964 acres of NFS lands.

Cumulative Effects

Past, present and reasonably foreseeable - future actions are those treatments and projects that occur on, or directly adjacent to, NFS lands which have affected or could affect forest resources. The residual effects of past actions, existing effects of current actions and anticipated effects of future actions will be added to the direct and indirect effects of the predicted oil and gas activities to disclose cumulative effects in the EIS for oil and gas leasing. Some of the different types of projects which have taken place, or, are now occurring on the FNF at this time, are found in Table 3.4-1.

With all of the various treatments taking place on the FNF, very few projects are causing adverse effects upon the soil resource. There are periodic problems with fragile soils derived from North Horn sediments due to grazing or heavy snowpack conditions, but, it's generally a small disturbance and can be easily identified and mitigated on the landscape. The same exists for wildfires, prescribed fire and wildland fire use, with these fire disturbances only lasting 1 to 3 years on the ground before, rehabilitation, and natural restoration of the fire-damaged terrain.

There are temporary impacts associated with road construction activities, but FNF engineering personnel are generally on-scene to size culverts, slope the road prism and manage drainage conditions. Modern OHV Jamborees are well-managed events and the new travel plan limits motorized vehicles from fragile/erosive terrain and cross-country travel. Many on-going projects (reforestation, road obliteration, seeding treatments, fence construction, mine closures, habitat improvement etc.) are actually beneficial on-the-ground and allow for soil stabilization.

With the gross disturbance being projected to occur on NFS lands due to oil and gas leasing activities amounting to 1,421 acres of ground displacement, with 350 acres of net disturbance (0.02 in size – or, much < 1 % of the entire Forest) after applying the SLT&Cs, mitigation measures and operation controls, then the roads and production field(s) will not compromise soil resources on the FNF.

3.9 WATER RESOURCES

3.9.1 Affected Environment

Geographically the Forest straddles the divide between the Great Basin and the Colorado Plateau. This transition zone is comprised of a mix of high mountain ranges and plateau lands, sometimes referred to as the Utah High Plateaus. The Sevier River watershed first trends north to south (Otter Creek) and then south to north, cutting a wide valley swath below the Forest. Several broad, north-south trending valleys separate the Markagunt Plateau on the west and the Sevier Plateau on the east. The Fremont River and tributaries of the Muddy River drains the eastern portion of the Forest into the Colorado River Basin. The Beaver River and Sevier River tributaries drain the western portion of the Tushar and Pahvant Mountains and Forest. Elevations vary from approximately 4,800 feet near Oak City to 12,169 feet at Delano Peak on the Tushar Mountains. Boulder Mountain is one of the largest timbered, high elevation plateaus in the United States.

The Fishlake National Forest supports a variety of terrestrial and aquatic wildlife species that contribute to ecosystem function in a wide array of habitats and settings. The many lakes, reservoirs, and streams support an active sport fishery. The Forest is known for the deep cold waters of Fish Lake. The plateaus and high elevation lakes of the Forest characterize the Forest's unique geologic features. Many of the rivers and creeks throughout the Forest provide habitat for endemic trout populations, including Bonneville and Colorado River cutthroat trout. These waterways also provide excellent, diverse sport-fishing opportunities. In addition to supporting wildlife biodiversity, these water resources provide culinary water to adjacent communities. The Forest has over 400 miles of streams with potential for perennial fish habitat and about 50 fish-bearing lakes. Most of the Forest is part of the Sevier River Basin, a closed habitat system draining into the Great Basin. The eastern parts of the Forest drain to the Colorado River Basin.

Water Rights

There are 3,815 water rights that within the Forest or for domestic uses are on or within approximately 1 mile of the Forest Boundary. There are 267 water rights for domestic uses that are on or within about 1 mile of the Forest boundary (including Forest Service administration, recreation residences and campgrounds), 24 for irrigation, 1, 212 for stock watering (important and very common use on the Forest), and 2,312 for other uses. Many of the domestic water rights include inholdings within the Forest, or are for communities or residences below the Forest boundary. There are no officially designated Municipal Watersheds designated within the Forest.

Water Quality

Water quality in the Forest is influenced by several factors including geology, soils, vegetation, and human activities. Low dissolved oxygen, high phosphorous loads, and sedimentation are the prevailing water quality problems. In general, water quality issues are closely related to human activities that cause surface disturbance such as road use, grazing, and recreational use.

Water quality is assessed in terms of designated beneficial uses as defined by the State of Utah Division of Water Quality (UDWQ). The majority of streams and reservoirs on the Forest provide water for domestic and agricultural uses, cold-water fisheries, recreation, and wildlife. Maintaining the quality of these waters is becoming increasingly important as the demand for water increases with the growing urban population next to the Forest. Streams and lakes that the State considers impaired, and thus not able to meet their designated beneficial uses, are reported on the State's 303(d) list, which is updated every other year. Listed water bodies are then scheduled for TMDL development. The Forest streams and reservoirs shown on the newly approved 2010 State's 303(d) list (UDWQ 2010) are discussed below.

Manning Meadow Reservoir- Dissolved Oxygen and Total Phosphorous for Cold Water Aquatic Use attributed to grazing (likely recreation and summer homes contributing too). Fish kill has occurred and reservoir is mesotrophic. This drainage is rated as low potential/low certainty on the oil and gas occurrence potential map contained in the RFDS. Manning Meadow Reservoir holds the brood stock population of Bonneville cutthroat trout population for the State of Utah. It is very important statewide for native Bonneville cutthroat trout reintroductions around the State.

Otter Creek (Koosharem Reservoir to headwaters)- Temperature for cold water aquatic use attributed to unknown factors is the reason for listing. Otter Creek was sampled above the reservoir and at the Forest boundary in water year 2010, and the maximum recorded temperature was 13.57 degrees Celsius (max allowed is 20 degrees for 3A aquatic use), but samples were not included in the 2010 report. In light of recent data collected, the Forest tributary portion of this reach could be delisted in a subsequent 303(d) list. This drainage is rated as low potential/low certainty in the oil and gas occurrence potential map. The drainage is very confined and would not likely have oil and gas development activity. There would be more likelihood of development occurring on private lands in Daniels Canyon or in the headwaters of this drainage on Forest where there is currently road access and slopes are not as steep.

Otter Creek (Box Creek)- Listed due to total phosphorous, habitat alterations, sediment/silt for cold water aquatic use attributed to agriculture, habitat modification and habitat modification (other,\ dams and irrigation diversions). There is no agriculture use on the Forest, and irrigation diversion is at the Forest boundary. Dams are located on the Forest. Box Creek was sampled in 2010 at the Forest boundary, but samples were not included in the 2010 report. This drainage is rated as low potential/low certainty in the oil and gas occurrence potential map.

Lower Box Creek Reservoir- Listed due to pH and temperature for cold water aquatic use and is mesotrophic. This drainage is rated as low potential/low certainty in the oil and gas occurrence potential map.

Kents Lake (Middle) – Listed due to temperature and total phosphorous for cold water aquatic use attributed to grazing, recreation, land development and redevelopment, and is eutrophic. This reservoir has a low priority for new TMDL. TMDL was completed in 2002. This drainage is rated as moderate potential/low certainty in the oil and gas occurrence potential map. This reservoir is heavily used for recreation.

Three Creeks Reservoir- Listed due to pH attributed to unknown factors. There is a low priority for TMDL. It was newly listed in 2010. This drainage is rated as low potential/low certainty in the

oil and gas occurrence potential map. A local Boy Scout Camp is located above the reservoir on the southernmost tributary. There is another large tract of private land inholding on the stream tributary from the east.
Upper and Lower Quitchupah Creek- Benthic Macro-invertebrates is the reason for listing. These are a low priority for a TMDL. It is newly listed. This drainage in the oil and gas occurrence potential map is rated as high potential/high certainty.

Forsyth Reservoir- Listed due to dissolved oxygen and total phosphorous for cold water aquatic use attributed to grazing and recreation. TMDL is completed. The first year the reservoir was fully supporting uses was 2010. Reservoir is oligotrophic on new 2010 report. This drainage is rated as low potential/low certainty in the oil and gas occurrence potential map. Forest Service management in the headwaters of U.M. Creek likely have contributed to the improved water quality conditions.

Johnson Valley Reservoir- Listed due to total phosphorous for cold water aquatic use. TMDL has been completed. This drainage is rated as low potential/low certainty in the oil and gas occurrence potential map. There is grazing and moderate to heavy recreation use in this drainage. Johnson Valley Reservoir is filled by Lake Creek from Fishlake, Tasha, and 7-Mile creeks. Water management of the reservoir storage is heavily weighted to irrigation uses downstream below the Forest.

Mill Meadow Reservoir- Listed due to total phosphorous for cold water aquatic use attributed to heavy and almost unchecked recreation, grazing, and silvicultural management, and is hypertrophic. TMDL has been completed. Fully Supporting uses occurred in 2010 for the first time. This drainage is rated as low potential/low certainty in the oil and gas occurrence potential map. There are areas in the surrounding vicinity where Oil and Gas activities would be suitable and could be buffered from the reservoir.

Lower Bowns Reservoir- Listed due to pH, temperature, and dissolved oxygen for cold water aquatic use attributed grazing (recreation likely as well). This is a low Priority for a TMDL. The reservoir is mesotrophic and newly listed this year. This drainage is rated as high potential/low certainty in the oil and gas occurrence potential map.

Drinking Water Sources

Groundwater in the Forest serves as a source of drinking water for nearby towns, cities, and campgrounds. Generally natural spring sources that have collection systems, rather than wells or surface sources are used for drinking water in the communities surrounding the Forest. The Utah Department of Environmental Quality has designated protection zones for these sources of drinking water.

Groundwater

Groundwater in the Forest is recharged from local precipitation that averages 8 inches per year at low altitudes and 33 inches per year in the mountains. The precipitation is snow and rain from generally eastward-moving storms during the winter and from thunderstorms associated with northward air movements in late spring and summer (monsoons). Groundwater moves from recharge areas in the mountains and adjacent alluvial slopes toward the valleys. Groundwater is discharged at land surface as springs and creeks. It can also be utilized by plant roots and subsequently transpired to the atmosphere and pumped from wells and springs for water supply use. Groundwater can also migrate into deeper, permeable basin-fill deposits and bedrock through which it can flow into adjacent valleys.

There are numerous springs located throughout the Forest. Discharges from these springs are probably associated with permeable bedrock, rock formations on the mountain slopes and in the basin-fill deposits. Most of the springs within and adjacent to the Forest receive recharge from precipitation that falls within the project area, and therefore have the potential to be impacted by land use activities.

Groundwater in the basin-fill deposits generally flows from the mountain highlands toward the adjacent valleys. Shallow groundwater that flows into a topographically closed basin does not leave the basin and eventually evaporates from the soil surface or is transpired through plants. Some valleys could also receive groundwater inflow from adjacent unclosed basins.

Groundwater within and adjacent to the Forest is withdrawn for a number of beneficial uses, including drinking water, agriculture (irrigation and stock watering), industry (mining), and wildlife management. Thermal springs that receive groundwater discharge from deep rock formations are also present near the around Cove Fort and Sulphurdale. Well and spring discharges have a wide range of yields in the vicinity of the Forest. The communities around the Forest use spring sources and groundwater wells for their drinking water (UDWQ, 2011b). These spring and well sites have Surface Water Protection Plans approved by the State to insure the quality of water needed to meet the required drinking water standards. Many of the spring sources and their associated Source Water Protection Zones are located within the Forest boundaries. Drinking water yields likely range from a few hundred gallons per minute for smaller springs up to about 2,000 gallons per minute for the largest community well in the area.

The communities around the Forest use spring sources and groundwater wells for their drinking water. These spring and well sites have Drinking Water Source Protection Plans for surface water and groundwater, approved by the Division of Drinking Water, to ensure the quality of water meets the required drinking water standards. Many of the spring sources and groundwater wells, with their associated Drinking Water Source Protection Zones (DWSPZs), are located within the Forest boundaries. Drinking water yields likely range from a few hundred gallons per minute for smaller springs up to about 2,000 gallons per minute for the largest community well in the area.
The State of Utah owns all of the water within the State, and the State Engineer issues water right certificates for appropriated beneficial uses. Groundwater resources have not been well-studied in the Forest.

Typical of high elevation lands, the Forest serves primarily as recharge zones. Unlike lower elevation valley bottoms, forest lands do not contain extensive unconsolidated deposits that support usable aquifers. However, there are consolidated bedrock aquifers at depth within the Forest that can provide usable quality groundwater. The majority of groundwater basins in the Forest are fully or almost fully appropriated, meaning that future development of groundwater is unlikely.

Aquatic and Riparian Ecosystems and Wetlands

This region is characterized by an arid climate, where annual precipitation ranges from less than 10 inches in the valleys to less than 35 inches in the highest mountains. Much of this precipitation infiltrates through the soil profile and then into bedrock to become groundwater. Thus, surface water and associated aquatic and riparian ecosystems are extremely limited in extent. Aquatic and riparian ecosystems comprise approximately 1 percent of lands within the Forest, yet these habitats are significant in supporting biodiversity, and they perform critical ecosystem functions in maintaining dependent fish and wildlife populations, filtering and storing runoff and sediment produced by the watershed, and attenuating floods. These habitats are also important focus areas for human uses, such as recreation, livestock grazing, and water diversion/development for agricultural or domestic uses.

Aquatic ecosystems are defined as “environments characterized by the presence of standing or flowing water” (Forest Service Manual 2605). Within the Project Area, aquatic ecosystems are associated with lakes, streams, springs, seeps, and ponds.

Wetlands are those areas that are inundated or saturated by surface water or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. Riparian areas are defined as a vegetated ecosystem along a water body through which energy, materials, and water pass. Riparian areas characteristically have a high water table and are subject to periodic flooding and influence from the adjacent water body. These systems encompass wetlands, uplands, or some combination of these two landforms. They will not in all cases have all the characteristics necessary for them to be also classified as wetlands. These definitions may vary.

The functions of wetlands and riparian areas include water quality improvement; stream shading; flood attenuation; shoreline stabilization; ground water exchange; and habitat for aquatic, semi-aquatic, terrestrial, migratory, and rare species. Wetlands and riparian areas typically occur as natural buffers between uplands and adjacent water bodies. Loss of these systems allows for a more direct contribution of nonpoint source pollutants to receiving waters. The pollutant removal functions associated with wetlands and riparian area vegetation and soils combine the physical process of filtering and the biological processes of nutrient uptake. Riparian systems, particularly in western regions, have been shown to stabilize the recharge of shallow aquifers in a manner that supports stream flow of longer natural duration.

Wetlands and riparian areas can play a critical role in reducing NPS pollution by intercepting surface runoff, subsurface flow, and certain ground water flows. Their role in water quality improvement includes processing, removing, transforming, and storing such pollutants as sediment, nitrogen, phosphorus, and certain heavy metals. Research also shows that riparian areas function to control the release of herbicides into surface waters. Thus, wetlands and riparian areas buffer receiving waters from the effects of pollutants or they prevent the entry of pollutants into receiving waters. It is important to consider that degradation of wetlands and riparian areas can inhibit their ability to treat pollution.

3.9.1.1 Water Resources Regulation and Policy

Utah Safe Drinking Water Act Terms

Public Water System (PWS): a system, either publicly or privately owned, providing water through constructed conveyances for human consumption and other domestic uses, which has at least 15 service connections or serves an average of at least 25 individuals daily at least 60 days out of the year and includes collection, treatment, storage, or distribution facilities under the control of the operator and used primarily in connection with the system, or collection, pre-treatment or storage facilities used primarily in connection with the system but not under the operator's control.

Community Water System (CWS): a PWS which serves at least 15 service connections used by year-round residents or regularly serves at least 25 year-round residents.

Non-Transient Non-Community Water System (NTNCWS): a PWS that regularly serves at least 25 of the same nonresident persons per day for more than six months per year. Examples of such systems are those serving the same individuals (industrial workers, school children, church members) by means of a separate system.

Transient Non-Community Water System (TNCWS): a non-community PWS that does not serve 25 of the same nonresident persons per day for more than six months per year. Examples of such systems are RV parks, diners or convenience stores where permanent nonresident staff number less than 25, but the number of people served exceeds 25.

Drinking Water Source Protection Zones

Groundwater Source Zone 1: is the area within a 100-foot radius from the wellhead or margin of the collection area.

Groundwater Source Zone 2: is the area within a 250-day ground-water time of travel to the wellhead or margin of the collection area, the boundary of the aquifer(s) which supplies water to the ground-water source, or the ground-water divide, whichever is closer.

Groundwater Source Zone 3: is the area within a 3-year ground-water time of travel to the wellhead or margin of the collection area, the boundary of the aquifer(s) which supplies water to the ground-water source, or the ground-water divide, whichever is closer.

Groundwater Source Zone 4: is the area within a 15-year ground-water time of travel to the wellhead or margin of the collection area, the boundary of the aquifer(s) which supplies water to the ground-water source, or the ground-water divide, whichever is closer.

Transient Source Zone T2: is the area within a 250-day ground-water time of travel to the wellhead or margin of the collection area, the boundary of the aquifer(s) which supplies water to the ground-water source, or the ground-water divide, whichever is closer.

Transient Source Zone T4: is the area within a 10-year ground-water time of travel to the wellhead or margin of the collection area, the boundary of the aquifer(s) which supplies water to the ground-water source, or the ground-water divide, whichever is closer.

Surface Water Zone 1: (A) Streams, rivers and canals: Zone 1 encompasses the area on both sides of the source, 1/2 mile on each side measured laterally from the high water mark of the source (bank full), and from 100 feet downstream of the point of departure to 15 miles upstream, or to the limits of the watershed or to the State line, whichever comes first. If a natural stream or river is diverted into an uncovered canal or aqueduct for the purpose of delivering water to a system or a water treatment facility, that entire canal will be considered to be part of Zone 1, and the 15 mile measurement upstream will apply to the stream or river contributing water to the system from the diversion. (B) Reservoirs or lakes: Zone 1 is considered to be the area 1/2 mile from the high water mark of the source.

Surface Water Zone 2: the area from the end of Zone 1, and an additional 50 miles upstream (or to the limits of the watershed or to the State line, whichever comes first), and 1000 feet on each side measured from the high water mark of the source.

Surface Water Zone 3: the area from the end of Zone 2 to the limits of the watershed or to the State line, whichever comes first, and 500 feet on each side measured from the high water mark of the source.

Surface Water Zone 4: the remainder of the area of the watershed (up to State line, if applicable) contributing to the source that does not fall within the boundaries of Zones 1 through 3.

The State of Utah designates water sources for culinary and municipal water supplies to be protected according to the provisions with the Utah State Source Water Protection Plans. Oil and gas activities are generally unsuited and would not be allowed in a Source Water Protection Zone (SWPZ) including surface and groundwater zones. These areas would be under a NSO stipulation under the preferred Alternative C. Municipal watershed areas outside of SWPZs will be under SLT&C under Alternative B and C. Municipal watershed and SWPZs under Alternative D will not be leased. SWPZs are delineated in coordination with the State. For the purpose of this analysis the Forest will not delineate SWPZs, but will use the State of Utah's SWPZ coverage.

Transient water system protection areas include about 41,538 acres within the Forest. The most likely DWPZs that could be impacted as a result of future leasing, are the ones located on the Eastside of the Pahvant Range, and those on the Westside of Monroe Mountain that serve the communities within the Sevier Valley. Management actions in the vicinity of municipal water sources should be coordinated with the municipality and may require a site review of the source protection plans and the water sources. The State of Utah has requested that the Forest should require lease stipulations that ensure that proposed drilling would not adversely affect any drinking water sources. In coordination with this request, the Forest has proposed these source water protection areas as being under a NSO stipulation up to zones 1-3 under Alternative C.

Ground Water Protection

It is the responsibility of the BLM to ensure that usable ground water zones, including Sole Source Aquifers (SSAs) and DWSPZs, are protected through review and analysis at the filing of a notice of staking (NOS) or APD, and during subsequent drilling and completion operations (Ground Water Protection Analysis and Documentation Process-Instructional Memorandum No. UT 2010-055, BLM, 2010). Several sources give guidance and regulations for protection of ground water. These regulations and guidelines are contained in the project record in the water resources section.

Anti-degradation

The intent of the anti-degradation component of State standards is to protect existing uses and to maintain high quality waters. The anti-degradation policy protects water quality in waters where the quality is already better than the criteria including all surface waters of the Forest which are Category I waters. Some key feature of the anti-degradation policy is that discharge will not be allowed into the Category I waters and that BMPs are crucial in the protection of Category I waters. Utah's anti-degradation policy prohibits the degradation of water quality of in streams on NFS lands. Additionally, the policy requires that alternative management options and the environmental and socioeconomic benefits of proposed projects are made available to concerned stakeholders. The Forest is currently and will continue to comply with this policy as part of oil and gas Leasing and subsequent development to maintain the quality and uses of Forest waters.

3.9.2 Environmental Consequences

Drinking Water Source Protection Zone Lease Notice (COA)

Under Alternative B, a lease notice would be attached to future leases for the protection of DWSPZs (Appendix A). Under all other alternatives, DWPZs would be protected with either a NSO stipulation, or would be designated No Lease.

General Effects to Water Quality
Facility construction, maintenance, and use could increase the potential for surface erosion, which could contaminate surface water and adversely impact stream channels and aquatic habitats. Water from exploration and production facilities could become contaminated with chemical pollutants used at the facilities and flow from the disturbed areas to adjacent surface waters. Springs, streams, lakes and reservoirs, and wetlands are particularly vulnerable to pollution and increased sediment loads. Culinary water sources are of special concern.

It is nearly impossible without specific development plans to say how much if at all the difference in effects magnitudes would be between alternatives on hydrologic resources. Site specific analysis will need to occur later, but in general will likely show that there will be negligible effects from any of the action alternatives and only minimal differences between the different action alternatives. This is because in most cases (on slopes 0 to 20% and on slopes that most development and use occurs) a 100-foot buffer is generally sufficient to limit hydrologic and aquatic effects (USDA Forest Service 1986). However a 300-foot buffer is generally sufficient for even very steep slopes over 40% (USDA Forest Service 1986). Alternatives C and D place a NSO stipulation on slopes greater that 35%, therefore there should not be a need for 500 foot buffers, although they would generally be more efficient, even if just negligibly, at limiting hydrologic and aquatic effects. There would be a small likelihood of water quality impairments from alternative B, and slightly lower with each of the following alternatives as well, with a negligible difference between the alternatives.

Both the quantity of the eroded material and the percentage of the material that makes its way to a stream are wholly dependent upon very site-specific factors including: soil characteristics, ground slope, distance between the disturbance and the stream, buffers to the stream, and vegetation characteristics of the area between the disturbance and the stream, among others. For example, in certain areas site conditions might tend toward producing minor surface erosion from sheet flow, which typically would produce small-sized sediment particles. If this were combined with either a long, low-gradient distance between the source and the stream, these particles would likely be deposited before reaching the channel and thus would not impact water quality. In other areas, site conditions could produce gullies or mass earth movements

with a direct connection to a stream system, thus adversely impacting water quality by adding large amounts of sediment with varying particle sizes to a stream.
Once sediment has reached a stream, the distance and timing of its downstream progression is highly dependent upon factors such as particle size, flow patterns, stream velocity, bed substrate, and channel morphology, among others. For example, fine sediments derived from shale and clay are likely to remain suspended in all but the slowest moving water, temporarily causing increased turbidity and sediment concentration, but not necessarily destabilizing the stream channel, which could lead to longer term adverse water quality impacts. Particle sizes added en masse to a stream might initially be deposited rather than transported, with finer sizes being gradually winnowed away over time, or the deposit might move downstream as a slug of sediment as a result of a single large storm event. A stream with a high percentage of pools might serve as a reservoir for sediments, temporarily mitigating the water quality impact, but over the long term altering the channel morphology. As these few examples show, the variations in sediment transport are endless and thus difficult to predict, especially for general types of disturbances in unknown locations.

Localized runoff that can cause adverse sediment-related water quality impacts is similarly site-specific. Construction activities in areas with steep slopes and less permeable soils often result in increased runoff from uplands. On a local level, and/or where the impacted acreage represents a higher percentage of the watershed area, the increased runoff volumes could trigger gully development and/or accelerated stream bank erosion in receiving streams. It could also exacerbate instability in previously existing deteriorated or vulnerable streams. Both would have adverse water quality impacts due to sediments. Construction activities in other areas (those with flatter gradients, more permeable soils, or lower natural drainage density, for example) might only negligibly increase local runoff, with consequent non-existent sediment impacts. The type of construction activity also dictates the potential for localized increased runoff. Well pads are typically bermed and thus do not release the increased runoff off-site. Roads with their attendant diversion ditches and culverts often alter natural drainage patterns, concentrate flows and redistribute runoff, often increasing it on a local level. Inadvertent releases of produced water would also function as locally increased runoff on a very short-term basis, with a similar potential for sediment-related impacts.

For all of these reasons given above, it is only possible to estimate adverse sediment-related water quality impacts from the connected actions on surface water in a general manner. Although they would most likely be temporary or short-term in duration, their magnitude could range from negligible to major, depending upon the location of the activity, the effectiveness of the environmental protections measures, and the occurrence of accidental releases. Therefore, this issue would need to be assessed more thoroughly during the site-specific NEPA process for specific proposals.

In general, the actual acreage of disturbance associated with any given well pad is relatively small, compared to the natural setting, and acreage associated with linear features such as roads and pipelines would be dispersed. This would also tend to reduce the potential for adverse sediment-related water quality impacts. Assuming that environmental protection measures or BMPs, are properly implemented, that disturbance is distributed over multiple watersheds or sub-watersheds, and that individual project NEPA analysis is done correctly, adverse sediment-related water quality impacts would likely be negligible or minor for the action alternatives, at least as a result of the normal course of events, major if abnormally high events occur at the watershed scale. All action alternatives would have at least some potential or risk for some adverse effect on water quality. As noted above, whether these pollutants adversely affected water quality and by how much and for how long is uncertain to determine because specific activity locations are not known and these impacts would vary by site location and conditions. Thus, future project-specific NEPA analyses would need to be relied upon for further analysis of this measurement indicator. However, the impacts would likely be negligible to minor as long as the existing environmental protection requirements are properly implemented and no accidents occur.

Under Alternative B, the hydrologic areas would only have Forest Plan Standards (at least 100 foot buffer) and SLT&C apply. Under Alternative B, there is some risk of having disturbance within 300 feet of water sources. There would also be new stream crossings created under Alternative B as well that would increase the risk to water resources. Under alternative C, the hydrologic areas would be NSO within 300 feet except at approved travel route crossings, and for alternative D they would be NSO within 500 feet except at crossings. Therefore, we can only say that the likelihood of road miles and acres disturbed with associated effects would be higher for alternative B, less for alternative C and would most likely only be from necessary stream crossings, and even slightly less for alternative D and would be likely only be from necessary streams crossings. The Forest is making slopes over 35% NSO in alternatives C and D, therefore there technically should not be a need for 500 foot buffers, although they would generally be more efficient, even if just negligibly, at limiting hydrologic effects. There would be a small likelihood of water quality impairments from alternative B, and slightly lower with each of the following alternatives as well, with there likely only being a negligible difference between any of the alternatives at the watershed, and Forest wide scales.

Drinking water protection zones are determined by the municipality that will use the water and these zones are approved by the State and therefore are not uniform in size or shape. The hydrology specialist report (contained in the project record) includes a map illustrating DWSPZs on the Forest. There is 92,646 acres of Municipal Watershed Protection Areas within the Forest, and 41, 538 acres of Transient community water system acres within the Forest. Under Alternative B only SLT&C will apply to leased areas within Source Water Protection Areas. Alternative C will have NSO for drinking water protection zones and CSU/SLT&C for campground systems. Alternative D will be No Lease (NL) within drinking water protection zones and in the vicinity of campground systems.

There is the possibility for potential roads and disturbance under Alternative B within the DWSPZs. For the most part this would likely not affect drinking water sources because most drinking water protection zones currently have native types or improved roads within them already. Concerns would likely arise by local communities and future proposals would need to address potential for affecting local communities' drinking water and mitigation measures to prevent impacts for oil and gas activities from accidents such as spills and pollution. Since, under Alternative C drinking water protection areas would be NSO, there is no potential to impact these areas from direct surface disturbance, and the likelihood of drinking water being polluted is minimized from accidental spills in the immediate areas as well. The Forest feels the drinking water protection zones are important areas to manage for and because of this wants to eliminate the potential for problems with drinking water by not allowing surface disturbance from these areas before leases are sold. However any development of land from oil and gas development outside of drinking water protection zones will need to be analyzed further in connection with local communities and the State as site specific proposals are received by the Forest. However, making these areas NSO upfront minimizes the likelihood of having effects on these important resource areas. Disclosing up front that campground areas will be CSU, will also allow the Forest to better protect these smaller drinking water systems as well compared to just having SLT&C as in Alternative B. Based the RFDS, there is a greater likelihood of development on the eastside of the Pahvant Range and on the north eastern portion of the Richfield District, and the very northern portion of the Fremont District. This limits the amount of likely effects to Community Water Systems to smaller areas of the Forest.

Under Alternative D, drinking water protection zones will not be leased (NL), and would have the same effect as alternative C when comparing the potential for roads, and surface acreages effects disturbed and hydrologically speaking would be better than Alternative B at preventing potential effects to water quality, or aquatic habitat. The impacts will be the same from Alternatives C and D because no surface acres will be disturbed and no new roads associated with oil and gas development will occur under both proposed alternatives within the drinking water protection zones. Based on the RFDS there is a greater likelihood of development on the eastside of the Pahvant Range and on the north eastern portion of the Richfield District, and the very northern portion of the Fremont District. This limits the amount of likely effects to Community Water Systems to smaller potential areas of the Forest.

There is no prediction of the number of crossings in the RFDS. However, there is some likelihood that there will be crossings of streams and riparian areas. There is a much lower likelihood of there being wetland crossings just because of there not being very many wetland acres within the Forest (less than 1% of the Forest is a wetland). The linear nature of both roads and streams will naturally lead to areas where overlapping of streams/riparian areas and travel routes occur. Most roads on the Forest have some sort of stream crossing on them. The likely occurrence of a road crossing a stream or riparian area is high. It is probable that with nearly 60 miles of new road being proposed in the RFDS that there will be additional stream crossings on the Forest. Site specific analysis will need to be conducted to more narrowly define the specific effects of any new number of crossings as actual proposals for road construction are received by the Forest. However, generalities of road construction and benefits of using construction BMPs on hydrologic resources are discussed later.

The area where aquatic habitat is disturbed would likely be less than that of just where hydrologically disturbance occurs. Not all hydrologic disturbance will directly or indirectly result in aquatic habitat degradation occurring. For example, not all perennial stream reaches on the Forest have resident fishery populations. However, based on the nature of streams crossing effects then there will be hydrological and aquatic disturbance of constructing stream crossings. Alternative A would have no leasing or disturbance from oil and gas activities. Any of the action alternatives will result in about 1,420 acres of gross disturbance equaling about 0.08% gross of the Forest being disturbed from oil and gas activities (the net disturbance would be about 350 acres (0.02%)) of the Forest. In other words there will be less than 1% but much more close to about 0% (0.02%) of the net Forest being disturbed from oil and gas activities. For Alternative B, the numbers calculated is the same percentages of likely gross and net percentages of the leasable acres being disturbed since 100% of the Forest will be leased under this alternative. For Alternative C, 56% of the total Forest (about 960,200) acres could have surface occupancy which means that of the approximately 960,200 acres that there could be a gross disturbance of 1,420 acres (0.15%) and a net disturbance of 350 acres (0.04%) of the total leasable acres for this alternative. For Alternative D, approximately 33% of the total Forest is proposed for lease but only approximately 7% (about 111,200 acres) of the total Forest could have surface occupancy and disturbance, which means that of the approximately 111,200 acres there could be a gross disturbance of 1,420 acres (1.3 %) and net disturbance of 350 acres (0.3 %) of the total leasable acres proposed for this alternative.

To summarize, the gross and net surface disturbance of the Forest will be relatively small in either case (~0.08% and ~0.02% respectively) based on the RFDS. Where the disturbance may occur including is more narrowly defined under Alternative C than B, and even more so under Alternative D than B and C. Hydrologic and aquatic effects potentially could be higher under Alternative B because surface occupancy is allowed within 300 and 500 feet of streams. The hydrologic and aquatic effects would likely be similar between Alternative C and Alternative D, but likely slightly better under Alternative D.

General Effects to Groundwater Quality

As drilling penetrates aquifers, drilling fluids could be injected into fresh water aquifers and affect the flow and quality of ground water, connected surface waters, and water supplies. Oil and gas being produced from wells could leak into fresh water aquifers and contaminate connected surface waters and developed water sources. Water injected underground for improvement of recovery or disposal could contaminate aquifers.

Groundwater can become contaminated from improper handling of hazardous materials associated with oil and gas exploration (such as fuels, drilling chemicals, and oil and saltwater produced during drilling and testing). These types of spills and leaks occur on the ground surface or in tanks and piping, and can migrate downward through the soil to groundwater. Contamination of groundwater can occur from improper production well construction, rehabilitation, or operation (such as oil and saltwater released by wellhead blowouts, and leakage between oil production zones and freshwater aquifers at depth or by interconnection of freshwater aquifers of different chemical quality). Once ground-water has been contaminated, it can flow to wells and springs, and render the groundwater unfit for beneficial uses. Reduced pressure or water levels in oil production zones that extend beneath multiple lease areas as a result of oil, gas, and saltwater withdrawal at oil and gas production sites can occur. Drawdown in the groundwater levels from multiple wells in and surrounding the project area such as agricultural irrigation wells may occur.

Natural groundwater quality in the Forest varies with well and spring location, well depth, and the types of rock through which the groundwater flows. Groundwater quality and temperature can vary with depth beneath the project area. Suitable groundwater for drinking can be found throughout and nearby the Forest Boundary. Groundwater at various levels may be saline, excessively hard, or contain other minerals such as fluoride and unacceptable for drinking water or other beneficial uses. Thus, it is important for oil and gas operators to avoid having saline waters mix with waters that are capable of being drinking, irrigation, and recreation waters.

Although existing regulations and policies provide an extensive framework for groundwater quality protection, accidents and violations are possible. Groundwater can become contaminated from improper handling of hazardous materials associated with the oil and gas exploration process (such as fuels, drilling chemicals, and oil and saltwater produced during drilling and testing). These types of spills and leaks occur on the ground surface or in tanks and piping, and can migrate downward through the soil to ground-water. Deep freshwater aquifers can also be contaminated by oil or saltwater leakage from production zones, or by interconnection of freshwater aquifers of different chemical quality, as a result of improper drilling and well construction practices during oil and gas exploration. State of Utah approved monitoring methods of wells or springs of interest for water quality will likely be required if within a reasonable distance from production wells.

In the event of an accident or violation, or inspections by regulatory agencies or reporting by lease permittees would likely result in early identification of groundwater quality problems and implementation of corrective measures. Groundwater contamination occurrences that were formerly common to oil and gas exploration operations are now prevented or quickly mitigated, due to the higher level of regulatory oversight and enforcement.

Water wells are commonly installed at oil and gas exploration sites to provide water supply during the drilling operation (for mixing drilling mud, cleaning equipment, cooling engines, etc.). Water supply requirements at oil exploration sites are estimated at 5,000 to 15,000 gallons of water per day, which is equivalent to about 4 to 10 gallons per minute of continuous pumping. This is a small rate of withdrawal, and would not be expected to produce interference drawdown impacts in nearby streams, wells and springs. Drawdown in the groundwater levels from multiple wells in and surrounding the project area such as municipal and agricultural irrigation wells is one possible concern with the groundwater quantity from production activities.

Groundwater use in and adjacent to the Forest could increase over time resulting in an increased demand for groundwater supply (including domestic drinking water, irrigation, stock watering, mining, power generation, and wildlife management). If such increases in groundwater withdrawal are concentrated in local areas, declines in ground-water levels could occur. In USGS 2007, the effects of climatic extremes on groundwater in Utah are summarized as: "Ground-water levels in Utah decline in response to decreased recharge during periods of drought and rise in response to increased recharge during wet periods" (USGS 2007). And " In areas of significant ground-water withdrawal, water-level changes are related more to the indirect effects of droughts or wet periods-the changes in withdrawal of water from wells resulting from the periods-than they are related to the direct effects of the changes in precipitation and recharge during droughts or wet periods. This is especially true in irrigated areas where both surface and groundwater are used for irrigation [especially like the Pahvant Valley west of the Pahvant Range around Fillmore that is considered a basin with large withdrawal] (ibid)." In addition, "Groundwater quality can also be affected by droughts, which in some basins have been followed by increases in dissolved solids; and by very wet periods, which cause and influx of good-quality recharge water, and in time, a decrease in dissolved solids. However, in the affected basins in Utah, the overall trend is toward poorer quality (ibid)."

In USGS 2008, water levels in relation to precipitation show good correlations between precipitation and water levels in wells in the Central Sevier Basin that starts about Yuba Reservoir and is a northeast trending basin going south about 1,900 square miles located along the transition between the Basin and Range and Colorado Plateau Physiographic Provinces in central Utah (USGS 2008). The basin is surrounded by the Sevier and Wasatch Plateaus to the east and Tushar and Valley Mountains, and the Pahvant Range to the west (ibid). The USGS paper states: "Ground-water levels in the central Sevier basin are less affected by anthropogenic stresses [well withdrawals] than ground-water levels in any of the other study basins as indicated by the results of the Mann-Kendall trend tests. The good correlations between water – level residuals from all wells in this basin and moving averages of annual precipitation indicate that precipitation-driven variations in ground-water levels can clearly be seen in areas that are not overly influenced by anthropogenic stresses [well withdrawals] (ibid).

Based on the USGS 2008 paper it would be reasonable to state that the likelihood of effects on the central Sevier Basin ground water levels would not be likely because the levels in the wells tend to be based on 8-year running averages of precipitation at multiple well sites within the basin, rather than human draw-down of the wells. Adding use of the groundwater would not likely lead to a greater impact to the groundwater than what is currently occurring along the bottom of the Forest. Most of the water pumped from groundwater sources would be pumped back in to the same formation as the well, minimizing the likelihood of effects at the well.

Existing oil and gas regulatory requirements should prevent spills and leaks of hazardous materials that would otherwise cause impacts to groundwater quality. The regulatory framework described above regarding the also applies to the connected and cumulative actions of oil and gas leasing (exploration and production). The prevention, inspection, and corrective action components of these regulations would minimize the risk of groundwater contamination and groundwater level declines. As with the oil and gas exploration process, however, accidents and violations are possible.

The potential for connected actions related to oil and gas leasing to affect surface water flow and ground water availability was described above. That potential was determined to be low for both surface water and groundwater, and would be virtually the same for all action alternatives, but the greatest potential for development includes the east side of the Pahvant Range, and northeastern portion of the Richfield District, and the very northern portion of the Fremont District as documented in the RFDS.

General Effects to Aquatic and Riparian Ecosystems

Generalized potential changes to aquatic habitat condition are described below, and additional fishery information is located in section 3.10. More site specific analysis will need to occur when actual lease units are being developed.

Potential effects of post-leasing oil and gas activities could include erosion or mass wasting, sedimentation, hydrocarbon mud pit failures, hazmat spills, decreased water quality due to increased erosion and stream bank disturbance during construction of road-stream crossings, loss of riparian habitat due to removal for reconstruction of existing roads or construction of new roads or road-stream crossings, and loss of riparian habitat through erosion or lowered water tables. Additionally, there is potential for chronic problems with degraded aquatic habitat and water quality due to stream instability and channel adjustments such as down-cutting, lateral migration or meander abandonment, changes in the amount and/or timing of runoff and sediment produced by a watershed, which brings about cumulative impacts within aquatic and riparian ecosystems.

This analysis assumes that there will be a short term elevation in increased sedimentation and decreased water quality within surface waters, and aquatic ecosystems due to increased erosion and streambank disturbance during construction of road-stream crossings on perennial streams for a short duration. The RFDS does not describe the number or extent of stream-road crossings that may need to be constructed for oil and gas exploration or development activities. Therefore, it is not possible to predict the exact extent or magnitude of effects from increased sedimentation and decreased water quality within aquatic ecosystems due to increased erosion and streambank disturbance during construction of road-stream crossings. Regardless of the number of stream crossings, the Forest will require the developer to conform to the Utah anti-degradation policy through applicable BMPs (including the newer Forest National BMPs) and State stream alteration permit conditions are required to be met as well.

There is a greater likelihood of riparian, hydrologic, and aquatic resources including water quality being impacted from Alternative B, than from both Alternatives C and D. This is primarily because of the buffers proposed from the different alternatives. Under all action alternatives there is some likelihood of having stream crossings leading to some short-term impacts to water quality, riparian areas, and aquatic habitat. In some cases the impacts would cease once the water has been diverted back into in channel following construction of the crossing, and once the turbidity of the stream clears up. In other cases it may take some larger flows to flush some fines out of the stream system and to rework the bedload materials to make conditions appear and function closer to what they were before the crossing was constructed.

Cumulative impacts are due to combined direct and indirect effects of oil and gas exploration or development activities with existing watershed disturbances, such as effects of fire, vegetation conversions, grazing, roads, off-highway vehicle use, road maintenance, mining, and water diversions. These combined effects cause changes in the amount and/or timing of runoff and sediment produced by a watershed, which brings about cumulative impacts within aquatic and riparian ecosystems. Potential cumulative effects include stream channel adjustments, such as down cutting, lateral migration or meander abandonment, loss of riparian habitat through erosion or lowered water tables, or chronic problems with degraded aquatic habitat and water quality due to stream instability. The magnitude and extent of cumulative effects will depend on watershed conditions and existing disturbances at the time that oil and gas exploration or development activities occur, which should be assessed in future site-specific project analysis. In general for this leasing analysis there will likely be more potential cumulative effects from Alternative B than C and D. Effects would likely be similar for Alternative D and C, but could be slightly better from Alternative D based on a larger buffer from perennial activities not associated with stream crossing construction.

Effects to Water Quality by Alternative

Alternative A
This alternative would not implement oil and gas leasing and therefore would not cause any effects.

Alternative B
This alternative would allow oil and gas leasing and the associated production activities across the widest landscape of the FNF. Utah Division of Oil, Gas and Mining (DOGM) stipulates that oil and gas drilling through all known (developed) aquifers shall be drilled with fresh water. Drilling mud used through the entire process is typically bentonite, naturally occurring clay that would not cause contamination. Typically, through the drilling process, drill mud pressure is monitored.

Loss of pressure into a water permeable zone usually is treated with a clotting agent that uses walnut shells or cotton seeds, both biologically acceptable in water zones. It is not in the producer's interest to lose drilling mud and industry BMP's are to clot this zone around the drill hole.

Contamination from a producing well is unlikely as they are steel-cased to the hydrocarbon (oil production) zone. The same situation exists for an injection well. DOGM requirements for steel casing on both types of well are required by State law. It is not in the well producer's interest to lose fracturing chemicals and water into freshwater aquifers, with hydrocarbon zones well below freshwater aquifers. Therefore the opportunity to inject these chemicals is minimized to an extremely low possibility by BMP's and economics.

According to Utah Administrative Code (R649-3-24. Plugging and Abandonment of Wells.) No. 3.3: A solid cement plug shall be placed from 50 feet below a fresh water zone to 50 feet above the fresh water zone, or a 100 foot cement plug shall be centered across the base of the fresh water zone and a 100 foot plug shall be centered across the top of the fresh water zone. Thus, under the abandonment process, contamination to ground water supplies is again mitigated.

Operating Standard #23 states that water needed for operations must be obtained in accordance with State water law. Further, the location and design of diversions on National Forest System lands are subject to review and approval of the responsible Forest Service official.

The use of the following standards shall be enforced as follows:

- Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development (Gold Book): specifies environmental analysis for site specific construction and maintenance, drilling and production operations, and reclamation standards.

- Best Management Practices – Through Utah's Administrative Code, DOGM and industry adopted standards, also specifies environmental analysis for site specific construction and maintenance, drilling and production operations, and reclamation standards.

- Region 4 Oil and Gas Roading Guidelines, addresses road and stream crossings with engineered solutions to mitigate aquatic disturbances.

- Fishlake National Forest Oil and Gas Construction and Operating Standards and Well Site Design Requirements (also requires a Spill Prevention Control and Countermeasures (SPCC) Plan consistent with EPA Region VIII Oil and Hazardous Substances Regional Contingency Plan.)

- Onshore Oil and Gas Order No. 1
- 36 CFR 228, 106-108
- 43 CFR 3162.3

Utah's water, particularly in the southern half of the state, is a scarce commodity. Any water used for oil and gas production will have to be acquired legally, from a legitimate water rights owner, and taken from a portion that is owned. Therefore, diversions of water would only be redirected and not reduced from any ground surface source (i.e. if a water rights owner has shares in X number of acre-feet and wishes to sell it to an oil and gas producer, they would not have it available to themselves to use, for irrigation). Any groundwater produced would be under the jurisdiction of the Utah Division of Water Rights. This agency has the legal jurisdiction on whether pumping groundwater sources would even be allowed. Whether water is used by an oil and gas producer from ground or surface sources, it would have to be acquired legally, and therefore not affect a Beneficial Use or the Clean Water Act (Operating Standard #23). By utilizing the above standards for mitigation, there should minimal effects to hydrologic resources.

Alternative C
This alternative would allow oil and gas leasing and the associated production activities across fewer acres of the FNF. Additional mitigation in Alternative C protects culinary water in SWPZ through NSO, as well as the above mitigations in Alternative B.

Alternative D
This alternative is the most restrictive in the number of acres available for actual surface occupancy for oil and gas operations. Additional mitigation in Alternative D protects culinary water in SWPZ through a No Lease (NL) stipulation, as well as the above mitigations in Alternative B.

Cumulative Effects
There are numerous projects that fall in the category of potential past, present, or reasonably foreseeable actions throughout the whole Forest. It is technically impossible to discuss what the cumulative effects of leasing and subsequent oil and gas development will be without knowing specific locations of developments on the ground and site specific analysis will occur later.

3.10 FISHERIES

3.10.1 Affected Environment

Trout species resident on the FNF and analyzed in this document include Bonneville cutthroat trout, Colorado River cutthroat trout, and other resident trout which includes rainbow trout, cutthroat trout, brown trout, brook trout, and lake trout. The first two species are Forest Service Region 4 Sensitive Species, and all of the species are Forest MIS.

The UDWR regulates harvest bag limits and open seasons for trout, monitors populations, stocks streams, and enforces fishing regulations. Populations fluctuate due to water quality, sediment inputs, and available food, but because of the Division's stocking program, populations are stable statewide. Specifically on the FNF, populations of rainbow trout are stable. There are 500 - 600 miles of potentially occupied resident trout, including rainbow trout, stream habitat and 4,680 acres of lake habitat across the FNF (Whelan 2008).

Resident Trout

Bonneville Cutthroat Trout

At the completion of the 2007-2010 surveys, there were 47 miles of occupied stream habitat for Bonneville cutthroat on the FNF. In the 2001-2003 timeframe there were about 38 miles of occupied stream habitat. This is a nine mile increase in occupied habitat since 2003 and a 34 mile increase since 1986. One conservation population, the North Fork of North Creek, is likely to be lost from effects of the Twitchell Canyon Fire, which would reduce occupied stream miles down to the 38 miles. Bonneville cutthroat populations are increasing in general in southern Utah due to active stream restoration work and reintroductions by the UDWR and co-operating agencies (Rodriguez 2006). Additional restoration work is planned on several streams over the next several years. Therefore, the long-term trend on the FNF for Bonneville cutthroat trout is upward and the population is viable (Rodriguez 2006).

Colorado River Cutthroat Trout

The Colorado River cutthroat trout only occurs on the Teasdale portion of the Fremont River Ranger District. There are about 18 miles of occupied suitable stream habitat for Colorado River Cutthroat Trout on the FNF.

Rainbow Trout

Rainbow trout are one of several important game fish species on the FNF from a recreation standpoint. A large number of people visit the forest every year expressly to enjoy the forest while fishing for these game fish. Rainbow trout on the forest are stocked regularly by the UDWR.

Rainbow trout inhabit both streams and reservoirs/lakes and require cold, clear water with pools deep enough to provide over-winter survival. They are diurnal, opportunistic feeders, which forage primarily on aquatic insects, but also eat terrestrial insects, crayfish and other fish. There are three basic threats to rainbow trout populations: dewatering streams for irrigation, chemical or hazardous materials spills or dumping in the water, and third, activities on the uplands that increase sediment in the stream and decrease water quality.

Cutthroat Trout

The UDWR regulates harvest limits and open seasons for cutthroat trout, monitors populations, stocks streams, and enforces fishing regulations. Populations fluctuate due to stocking rates, water quality, sediment inputs, and available forage, but because of the Division’s stocking program, populations are stable statewide. Specifically on the FNF, populations of cutthroat trout are stable. There are 500 - 600 miles of potentially occupied resident trout, including cutthroat trout, stream habitat and 4,680 acres of lake habitat across the forest (Whelan 2008).

Brown Trout

The UDWR regulates harvest limits and open seasons for brown trout, monitors populations, stocks streams, and enforces fishing regulations. Populations fluctuate due to stocking rates, water quality, sediment inputs, and available forage, but because of the Division’s stocking program, populations are stable statewide. Specifically on the FNF, populations of brown trout are stable. Brown trout are more common on lower elevation streams, and are more tolerant to high water temperatures and high water turbidity. They have the potential to get larger than typical and provide a quality fishery on several Forest streams. There are 500 - 600 miles of potentially occupied resident trout, including brown trout, stream habitat and 4,680 acres of lake habitat across the forest (Whelan 2008).

Brook Trout

The Utah Division of Wildlife Resource regulates harvest limits and open seasons for brook trout, monitors populations, stocks streams, and enforces fishing regulations. Populations fluctuate due to stocking rates, water levels and subsequent winter kill events, and available forage. Populations are stable statewide; specifically on the FNF, populations of brook trout are stable to increasing (Rodriguez 2006). There are 500 - 600 miles of potentially occupied resident trout, including brook trout, stream habitat and 4,680 acres of lake habitat across the forest (Whelan 2008). They are more common on higher elevation Forest streams. Brook trout are widely stocked by the UDWR on Boulder Mountain within the Teasdale portion of the Fremont River District, as well as other lakes on the FNF.

Lake Trout

Lake trout only occur on the FNF at Fish Lake. Lake trout were introduced as a game species by UDWR and were regularly stocked in Fish Lake until 1991. Since 1991 UDWR has monitored trends in lake trout numbers and forage fish levels using trend net studies. Ecological factors currently affecting lake trout are the accidental introduction of Eurasian milfoil, which has choked out the native bottom growing aquatic plant beds, and the illegal introduction of yellow perch to Fish Lake in the early 1970's, which is severely impacting the Utah chub, the primary forage fish for lake trout. This has caused lake trout to shift predation to rainbow trout in the lake, requiring stocking of larger sized rainbow trout. Lake trout populations have remained relatively stable since 1991, and may in fact be increasing slightly, although a fewer make it through the 22 – 26 inch bottleneck to become trophy trout.

General Effects to Resident Trout

Potential direct and indirect impacts to resident trout species from oil and gas activity on the forest are likely to occur from increased sedimentation inputs into the water, toxic inputs to the streams or reservoirs, adverse impacts to habitat and aquatic environment due to impacts to riparian habitat, spread of aquatic nuisance species, and from dewatering.

Increased sediment inputs are likely to occur from newly constructed roads near waters, stream crossings and pads where sediment can be washed into waterways. Such sediment inputs decreases water quality, negatively impacts aquatic insect populations, that are critical food for resident trout, and silts over gravel spawning beds negatively impacting reproduction. The site-specific placement of these facilities in relation to streams and reservoirs, as well as, mitigation/best management practices used will directly affect the amount of sediment entering the fisheries on the forest. Since this document is for the leasing of oil and gas parcels and is programmatic in nature rather than site specific, this analysis looks at protection measures provided by leasing stipulations by alternative and BMPs. Based on BMP's, well pads will be bermed and any water and associated suspended matter on the pad will be captured and processed as produced water, rather than allowed to drain into the natural hydrological system.

Removal of riparian vegetation resulting from new road construction adjacent to streams would have adverse impacts to aquatic habitat and the aquatic environment. As riparian vegetation is removed adjacent to the stream, it dramatically reduces the runoff filtration capacity of the riparian vegetation, increasing sediment inputs, and can cause banks to fail into the waterway. Second, if overhead cover is removed, water temperatures can rise and lessen the quality of resident trout habitat.

The activities associated with oil and gas development have a relatively low risk for spreading aquatic nuisance species, provided BMP's are followed for movement of water and proper cleaning of equipment used for pumping water. Recommended measures to avoid spreading aquatic nuisance species are included in the FOGOS. Additionally, any State or regional recommendations for stopping the spread of aquatic invasive species should be followed. Following these measures would provide further protection against spreading these problematic species. If these protection measure recommendations are not followed and any of these aquatic nuisance species, such as whirling disease, zebra mussel, quagga mussel, etc., were spread on the forest, they could have moderate to major adverse impacts to resident trout within that drainage.

As far as dewatering, it is unclear how much water will be demanded from the expected level of drilling as outlined in the RFDS. However, all water withdrawals from fisheries on the forest will need to be permitted through the Utah Division of Water Rights. It is expected that through this process, fish-supporting flows can be protected.

Effects to Resident Trout by Alternative

Alternative A

No impacts to resident trout individuals, populations or habitat should occur from the implementation of the No Action alternative, due to the fact that there would be no oil and gas development permitted on the forest.

Alternative B

Adverse effects to resident trout from alternative B will likely be minor. The impacts from alternative B are difficult to measure at the programmatic level rather than the site specific, however, the impacts will be greater than those for alternative C due to activities which may occur within or immediately adjacent to the stream channel, which may increase sediment inputs, increase the chance for toxic spills in the stream, and alter riparian habitat, which in turn effects aquatic habitat conditions.

Alternatives C and D each provide a NSO stipulation in a riparian buffer of a given distance, which allows analysis of an area which would be excluded from oil and gas development disturbance; whereas, alternative B only provides general BMPs (not defined spatial areas for analysis). Since the standard lease terms and best management practices apply to all alternatives, plus the additional stipulations described, it is therefore likely that the adverse impacts from alternative B will be somewhat greater than alternative C. Based on the BMP's, impacts to resident trout will likely be minor.

Standard lease terms include those with the standard lease forms, guidelines provided in the Oil and Gas Exploration and Development Gold Book, and the Fishlake National Forest Oil and Gas Construction and Operating Standards and Well Site Design Requirements. One of the most applicable standards to resident trout is Fishlake NF operating standards #13:

Stream crossings will be planned and constructed to minimize disturbance of the riparian and aquatic habitats by locating crossings at the most advantageous location and by crossing at or near the perpendicular. Structures must be designed to allow fish passage as needed to maintain habitat. Measures must be taken to minimize disruption of stream substrate. When no longer needed for operations, crossings must be removed and the stream and banks restored to pre-disturbance conditions/stream hydraulics. Sediment control measures must be used to minimize sediment introduction during all operations. Timing restrictions (construction and reclamation) may be needed to protect fisheries as coordinated with the UDWR and through permitting with the Utah Division of Water Rights, stream alteration program.

Alternative C

Adverse effects from alternative C will likely be negligible on resident trout. Under alternative C all perennial waters would be protected by a 300 foot riparian NSO buffer from the water's edge. Current literature shows that overland sediment transport distances increase with slope, and decrease with the complexity (roughness) of the riparian buffer zone (Belt and O'Laughlin 1992). However, overland flows rarely transport sediment more than 300 feet even on 47% and steeper slopes. Therefore, a 300 foot riparian buffer is capable of controlling overland sediment flows on most slopes and would therefore adequately protect resident trout and their habitat from overland sediment movement resulting from new roads built for oil and gas development. Additionally, very steep slopes over 35% carry the NSO stipulation and will not be developed under all of the alternatives. Sediment movement in ephemeral channels and washes is regulated by the amount/size of the ephemeral flow and can travel long distances. Road design criteria and BMPs will help reduce sediment influx/input to ephemeral channels that could be carried into streams. Leasing stipulations allow well locations to be adjusted slightly, which can also be used to minimized sediment influx to ephemeral channels.

Toxic chemical spills into watercourses containing trout can have major adverse impacts to fish populations; however, it is difficult to predict toxic spills and their severity to resident trout populations at the programmatic leasing level. Logically, the wider the riparian buffer protection and the more complex it is, the less likely toxic spills would make it into the perennial waterway and impact fish. Standard lease procedures such as required spill plans and containment equipment on site further reduce this risk. Additional measures, such as requiring pilot cars for trucks hauling hazardous materials on Forest roads adjacent to streams and riparian areas, can be considered and implemented at the site-specific NEPA stage.

Summer stream temperatures are a factor of concern for trout. Teti (2003) reported that sockeye salmon lose weight at temperatures over 17 degrees C, indicating stress. Monitoring of stream temperatures on the FNF since 2001 has suggested that peak summer temperatures to be of concern on several streams on the forest (unpublished FNF data). Overhead riparian cover along the stream plays a critical factor in regulating water temperatures, both in the summer and winter. Belt and O'Laughlin (1992) found extensive literature on the effect of buffer strips on water temperature. They found that a multitude of factors relating to the shading, density and complexity of the riparian buffer zone moderate solar energy heating of the stream. Teti (2003) suggested that the time period from 10:00am to 2:00 pm was the most important. As far as the effect of the bank side riparian vegetation on summer water temperatures, the 300 foot wide NSO stipulation is more than adequate to maintain shading so that effects to stream temperature from oil and gas development would be negligible.

Alternative D

Direct and indirect effects on resident trout specific to alternative D would be essentially the same as alternative C. The difference in NSO area (riparian buffer) between alternative C and D is an extra 200 feet (Alt C = 300 feet from water's edge; Alt D = 500 feet from water's edge). Based on studies of overland sediment transport, there is a negligible difference in sediment capture between 300 feet and 500 feet wide riparian buffer distances (Belt and O'Laughlin 1992). Logically this increased distance would provide an additional measure of safety over Alternative C as far as toxic spills are concerned; however, exactly what this means from a practical standpoint is difficult to measure at the programmatic leasing level. The larger NSO width would disallow surface development on 2.77 times more area, but would likely provide very little extra protection from sedimentation to the streams.

Cumulative Effects

There would be no cumulative effects to resident trout from the Alternative A, because there would be no incremental effects would add to any impacts from past, present or reasonably foreseeable actions. The incremental affects from any of the action alternatives (B, C & D), when added to past, present and foreseeable future actions would not cumulatively push the resident trout over a threshold away from the desired condition, or a decline in populations. None of the alternatives would add cumulative effects that would adversely affect population numbers or viability of resident trout in the long-term (> 10 years). Any adverse effects to aquatic species or aquatic habitat for future projects can be avoided or minimized through the use of BMP's and site-specific project design. The impacts from the activities are not expected to increase as a result of the implementation of one of the action alternatives.

Determination and Rationale – Bonneville and Colorado River Cutthroat Trout

Alternative A would not impact trout populations or habitat. Alterative B is the least protective, and under SLT&C may impact individuals but is not likely to cause a trend to federal listing or loss of viability. Similarly, Alternative C may impact individuals but is not likely to cause a trend to federal listing or loss of viability. While some impact may still occur, Alternative C includes a 300 foot riparian NSO buffer, which would help protect waters from increases in sedimentation, toxic spills and micro-climate effects from alterations to the riparian vegetation. Alternative D also may impact individuals but is not likely to cause a trend to federal listing or loss of viability, and may not provide a significant increase in resource protection over alternative C, based on the fact that the increased NSO buffer (500 feet) would not increase sediment filtration rates much over alternative C (300 feet).

Macroinvertebrates

Aquatic Macroinvertebrates

Aquatic macroinvertebrates are water living insects that are large enough to see with the unaided human eye. They provide an important ecological link between fish and the aquatic plants and microscopic food organisms. The streams, lakes and reservoirs on the Fishlake National Forest provide suitable habitat for aquatic macroinvertebrates. Their use as a monitoring indicator, as referenced in the Fishlake National Forest Plan, is tied to habitat quality measures for trout streams. The discussion below is thus limited to trout stream aquatic macroinvertebrate communities. Because of their strict habitat requirements they are useful indicators of aquatic habitat conditions and changes (Rodriguez 2006).

General Effects to Macroinvertebrates

Direct effects are impacts that would directly result in the death of aquatic macroinvertebrates. Given the required BMP's and standard lease terms and conditions, direct effects to macroinvertebrates are considered unlikely to occur. Indirect effects, those not directly connected in space and time are more likely to occur. Three indirect impacts to macroinvertebrates that may occur from the proposed oil and gas leasing and subsequent development activity are the introduction and spread of an aquatic nuisance species that changes the ecology of the aquatic habitat, indirectly reducing the habitat quality for native aquatic macroinvertebrates; increases in stream sediment loads from disturbances adjacent to the streams, which embed stream substrates and reduce habitat suitability and clean water for macroinvertebrates; and alterations to aquatic and riparian habitats that alter environmental factors and impact aquatic macroinvertebrates.

The activities associated with oil and gas development have a relatively low risk for spreading aquatic nuisance species, provided BMP's are followed for movement of water and proper cleaning of equipment used for pumping water. Recommended measures to avoid spreading aquatic nuisance species are included in the FOGOS. Additionally, any State or regional recommendations for stopping the spread of aquatic invasive species should be followed. Following these measures would provide further protection against spreading these problematic species.

The primary potential for impacting aquatic macro invertebrates would be from the introduction of fine sediment to the streams due to road or pad construction and increased use on non-paved roads. Fine sediment can change the species composition, diversity, and abundance of macroinvertebrates (Robertson 1997).

Second, alterations to aquatic and riparian vegetation can alter macro-environments and affect aquatic macroinvertebrates. These changes include the amount of organic material in streams, nutrient loads, and the removal of shading cover; which directly affects water temperature and photosynthesis. Belt and O'Laughlin (1992) found that buffer strips 98' and wider were wide enough to mitigate for adjacent impacts. Similarly, they found that narrower strips (33') were inadequate.

Direct and Indirect Effects Specific to Alternatives

Alternative A

No impacts to macroinvertebrate populations or habitat should occur from the implementation of the No Action alternative, due to the fact that there would be no oil and gas development permitted on the forest.

Alternative B

Adverse effects to aquatic macroinvertebrates from alternative B (Standard Lease Terms) will likely be minor. The impacts from alternative B are difficult to measure at the programmatic level rather than the site specific, however, it is assumed that the impacts will be greater than those for alternative C or D due to activities which may occur within or immediately adjacent to the stream channel, which may increase sediment inputs, and alter riparian habitat which in turn effects aquatic habitat conditions. Nevertheless, by following BMP's and standard lease terms, adverse impacts should be minimized.

Alternatives C and D

Adverse effects from alternative C (moderate resource protection) and alternative D (high resource protection) will likely be negligible on aquatic macroinvertebrates. Under alternative C all perennial waters would be protected by a 300' riparian NSO buffer from the water's edge. Current literature suggests that overland sediment transport distances increase with slope, and decrease with the complexity (roughness) of the riparian buffer zone (Belt and O'Laughlin 1992). However, overland flows rarely transport sediment more than 300' even on 47% and steeper slopes. Also, for each alternative, very steep slopes of 35% and greater will have an NSO stipulation. Therefore, a 300' riparian buffer is capable of controlling overland sediment flows on most slopes and would therefore adequately protect aquatic macroinvertebrates from sediment loads. Alternative D, which provides a 500' riparian buffer, would not provide much more protection from sedimentation over alternative C.

Based on Belt and O'Laughlin (1992), where 98' wide riparian buffers were adequate to protect against impacts to aquatic environmental conditions from adjacent habitat changes, the 300' and 500' riparian NSO buffers would be more than adequate to protect macroinvertebrates from habitat changes due to vegetation removal.

Cumulative Effects

There would be no cumulative effects to aquatic macroinvertebrates from the No Action alternative (A), because there would be no incremental effects that would add to any impacts from past, present or reasonably foreseeable actions. The incremental affects from any of the action alternatives (B, C & D), when added to past, present and foreseeable future actions (PPFFA) would not cumulatively push the aquatic macroinvertebrate community over a threshold away from the desired condition, or a decline in populations of desirable species. None of the alternatives would add cumulative effects that would adversely affect population numbers or viability of aquatic macroinvertebrate taxa in the long-term (> 10 years). Any adverse effects to aquatic species or aquatic habitat for future projects can be avoided or minimized on the forest through the use of BMP's and site-specific project design. The impacts from the activities listed in PPFFA are not expected to increase as a result of the implementation of one of the action alternatives.

Forest Service Sensitive Species

Southern leatherside chub

The leatherside chub is a small minnow native to streams and rivers of the southeastern portion of the Bonneville Basin. The bodies of adults are bluish above and silvery below and reach a maximum length of 150 mm. The skin has a leathery texture with very small scales. Once common throughout its native range, it has declined to the point that it is presently listed as a state sensitive species.

On the FNF, suitable habitat exists on tributaries of the Sevier River with low water velocities (2.5-45 cm sec-1), intermediate water depths (25-65 cm), and low percent composition of sand-silt or grave substrates (Wilson and Belk 2001). Leatherside chub are currently known on the Forest from main-stem Salina Creek and the lower few miles on the Forest of its Lost Creek tributary. Clear Creek and the lower Beaver River on the Forest have historical records. Currently there are about 17 miles of existing occupied leatherside chub habitat in Salina and Lost Creek on the Fishlake National Forest, and about an additional 13 miles of potential habitat on Clear Creek and the lower Beaver River.

General Effects to Leatherside chub
Potential direct and indirect impacts to leatherside chub from oil and gas activity on the forest are likely to occur from increased sedimentation inputs into the water, toxic inputs to the streams or reservoirs, adverse impacts to habitat and aquatic environment due to impacts to riparian habitat, spread of aquatic nuisance species, and from dewatering.
Increased sediment inputs are likely to occur from newly constructed roads near waters, stream crossings and pads where sediment can be washed into waterways. Such sediment inputs decreases water quality and negatively impacts aquatic insect populations that are critical food for leatherside chub. The site-specific placement of these facilities in relation to streams and reservoirs, as well as, mitigation/best management practices used will directly affect the amount of sediment entering the fisheries on the forest.

Any toxic chemical inputs to fisheries would primarily occur from accidental spills in or near riparian areas or wetlands. Examples of such spills would be fuel or liquid chemicals used in the drilling and maintenance of wells which are accidentally introduced into a waterway from a vehicle accidents or other mishap. Such spills are expected to be rare. They could, however, be highly impacting to the immediate fishery.

Removal of riparian vegetation resulting from new road construction adjacent to streams would have adverse impacts to aquatic habitat and the aquatic environment. As riparian vegetation is removed adjacent to the stream, it dramatically reduces the runoff filtration capacity of the riparian vegetation, increasing sediment inputs, and can cause banks to fail into the waterway. Second, if overhead cover is removed, water temperatures can rise and lessen the quality leatherside chub habitat.

The activities associated with oil and gas development have a relatively low risk for spreading aquatic nuisance species, provided BMP’s are followed for movement of water and proper cleaning of equipment used for pumping water. Recommended measures to avoid spreading aquatic nuisance species are included in the FOGOS. Additionally, any State or regional recommendations for stopping the spread of aquatic invasive species should be followed. Following these measures would provide further protection against spreading these problematic species. If these protection measure recommendations are not followed and any of these aquatic nuisance species, such as whirling disease, zebra mussel, quagga mussel, etc., were spread on the forest, they could have moderate to major adverse impacts to resident trout within that drainage.

As far as dewatering, it is unclear how much water will be demanded from the expected level of drilling as outlined in the RFDS. However, all water withdrawals from fisheries on the forest will need to be permitted through the Utah Division of Water Rights. It is expected that through this process, fish-supporting flows can be protected.

Direct and Indirect Effects Specific to Alternatives

Alternative A
No impacts to leatherside chub individuals, populations or habitat should occur from the implementation of the No Action alternative, due to the fact that there would be no oil and gas development permitted on the forest.

Alternative B
Based upon the predicted level of development, adverse effects to leatherside chub from alternative B (Standard Lease Terms) will likely be minor. However, impacts will be greater than those for the other action alternatives because under alternative B activities may occur within or immediately adjacent to the stream channel. This may increase sediment inputs, increase the chance for toxic spills in the stream, and alter riparian habitat, which will in turn affect aquatic habitat conditions.

Alternative C
Adverse effects from alternative C (moderate resource protection) will likely be negligible on leatherside chub.

Alternative D
Direct and indirect effects on leatherside chub specific to alternative D would be negligible.

Cumulative Effects
There would be no cumulative effects to leatherside chub from the No Action alternative (A), because there would be no incremental effects would add to any impacts from past, present or reasonably foreseeable actions. The incremental affects from any of the action alternatives (B, C & D), when added to past, present and foreseeable future actions (PPFFA) would not cumulatively push the leatherside chub over a threshold away from the desired condition, or a decline in populations. None of the alternatives would add cumulative effects that would adversely affect population numbers or viability of leatherside chub in the long-term (> 10 years). Any adverse effects to aquatic species or aquatic habitat for future projects can be avoided or minimized on the forest through the use of BMP's and site-specific project design. The impacts from the activities listed in the PPFFA are not expected to increase as a result of the implementation of one of the action alternatives.

Determination and Rationale
The No Action alternative would not impact leatherside chub populations or habitat. Alterative B is the least protective, and under SLT&C may impact individuals but is not likely to cause a trend to federal listing or loss of viability. Similarly, Alternative C may impact individuals but is not likely to cause a trend to federal listing or loss of viability. While some impact may still occur, the 300' riparian buffer included in Alternative C would help protect waters from increases in sedimentation, toxic spills and micro-climate effects from alterations to the riparian vegetation. Alternative D also may impact individuals but is not likely to cause a trend to federal listing or loss of viability, and may not provide a significant increase in resource protection over alternative C, based on the fact that the increased NSO buffer (500') would not increase sediment filtration rates much over alternative C (300').

Colorado River Native Species

Fourteen species of fish are native to the upper Colorado: the Colorado pikeminnow, bonytail, humpback chub, razorback sucker, Colorado River cutthroat trout, Rocky Mountain whitefish, roundtail chub, speckled dace, Kendall Warm Springs dace, flannelmouth sucker, mountain sucker, bluehead sucker, mottled sculpin and the Paiute sculpin.
http://www.fws.gov/coloradoriverrecovery/

At the level of activity that will be authorized by this programmatic leasing EIS, the potential downstream impacts, which are predicted to be minor to negligible at the subwatershed and forest scale, would be immeasurable against the background of variation due to downstream impacts, weather patterns, etc. This project would thus have no effect or no impact to downstream warm water Colorado River native fish species of concern. A few common species, including speckled dace, mountain sucker, and mottled sculpin, do occur on the FNF. Effects to these species would be similar to, but less than those to resident trout, since they are more tolerant of sediment and other environmental conditions. Colorado River cutthroat trout are covered under the resident trout analysis. Since there would be no measurable effects to downstream warm water Colorado River fishes, they will not be discussed further.

3.11 VEGETATION

3.11.1 Affected Environment

The FNF ranges from 5,000 feet in elevation to 12,169 at Delano Peak and provides habitat for a broad diversity of endemic plant species. There are diverse vegetative communities ranging from sagebrush-steppe to alpine-krumholtz tundra. Table 3.11-1 covers all plant species listed as Threatened or Endangered (USFWS, 2005); USFS Region 4 Sensitive species (USDA, 2003); and Forest Management Indicator Species (USDA, 1986), their status and which district they are known to occur on. There are no Federally Proposed plant species known to occur on lands administered by the FNF.

Table 3.11-1: Threatened, Endangered, Sensitive, and Management Indicator Species

Species	Status	Habitat or Occurrence Fillmore	Habitat or Occurrence Fremont	Habitat or Occurrence Beaver	Habitat or Occurrence Richfield
Threatened or Endangered Species					
San Rafael cactus	Endangered		Y		
Last chance townsendia	Threatened		Y		Y
Intermountain Regional Forester's Sensitive Species					
Maguire daisy	Sensitive		Y		
Barneby woody aster	Sensitive	Y			
Dana's milkvetch	Sensitive		Y		
Bicknell milkvetch	Sensitive		Y		
Paradox moonwort	Sensitive		Y		
Aquarius paintbrush	Sensitive		Y		
Tushar Mtn. paintbrush	Sensitive			Y	
Pinnate spring-parsley	Sensitive		Y		
Creeping draba	Sensitive			Y	
Nevada willowherb	Sensitive	Y			
Elsinore buckwheat	Sensitive	Y		Y	Y
Rabbit Valley gilia	Sensitive		Y		
Fish Lake naiad	Sensitive		Y		
Little penstemon	Sensitive		Y		
Ward's Penstemon	Sensitive	Y	Y	Y	Y
Angell cinquefoil	Sensitive		Y		
Arizona willow	Sensitive		Y		Y
Beaver Mtn. groundsel	Sensitive			Y	
Bicknell thelesperma	Sensitive		Y		
Sevier townsendia	Sensitive	Y			Y
Fishlake National Forest Management Indicator Species					
Rydberg's milkvetch	MIS		Y	Y	Y

3.11.2 Environmental Consequences

Effects to Vegetation by Alternative

The decision whether or not to open all or portions of the FNF to oil and gas leasing will have no direct effect on the plant species covered in this analysis. The potential impacts of actions allowed to occur on the FNF will only take place once site specific development of oil and gas is proposed and implemented. Analysis of potential effects is made based on possible impacts. The RFDS was used as a basis and measure of potential, and could have some inaccuracies. In order to truly measure the potential effects to these plant species, site specific analysis will be completed at each proposed development site.

Alternative A

Under this alternative there will be no impacts from oil and gas development to the TES or MIS plant resources on lands administered by the FNF. Alternative A makes no changes to the current actions of the FNF with relation to oil and gas development.

Alternative B

Alternative B is primarily a Forest wide SLT&C alternative. The potential for impacts to TES and MIS plants increases when compared to Alternatives A, C & D. At the time a lessee submits an APD, site specific analysis will be used to identify drill pad placements. The SLT&C allow for the movement of drill pads up to 656 feet. This may or may not be a sufficient distance to remove impacts from TES or MIS plant habitat.

All but one of the known populations of threatened or endangered plants on the FNF are contained within the high and moderate potential for development areas. The majority fall within the high potential for development area. Under item 6 of the SLT&C, federal law will necessitate an extensive effort to identify the presence or absence of these species within a leased area. The labor that would be required to do the site specific analysis may require more time than allowed with the SLT&C (60 days) due to timing limitations.

This action alternative "May Affect but not likely to Adversely Affect" Threatened and Endangered plant populations that fall within the project area or the viability of the species as a whole.

Under the RFDS three of the sensitive plant species that occur on the FNF are likely to be impacted. The habitats for Eriogonum batemanii var. ostlundii (Elsinore buckwheat), Penstemon wardii (Ward beardtongue) and Tonsendia jonesii var. lutea (Sevier Townsendia) all fall within areas that have high potential for development. The known populations of the remaining sensitive plant species, as well as the MIS plant species, primarily fall within the low and moderate potential areas.

Alternative B "may impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species" for all of the sensitive and MIS plant species known to occur on lands administered by the FNF.

Alternative C

In addition to the site specific analysis that will be necessary, some of these species are covered in conservation agreements and recovery plans that necessitate a NSO requirement in order to minimize any potential impacts. The NSO for these species was designed using a 1 mile buffer zone around known plant locations. Table 3.11-2 shows the species whose occupied habitats require a NSO along with the reference for such a designation. The NSO for these species removes 2.7% of the lands administered by the FNF from surface occupancy consideration. This does not represent all potential habitats for these species as knowledge about these species is still being gathered. The NSO does greatly reduce the potential impacts to these species as lands known to support them will not be affected by surface disturbance.

Table 3.11-2: Species with Conservation Plans

SPECIES	STATUS	AGREEMENT
San Rafael cactus Pediocactus despainii	Endangered	San Rafael cactus draft Recovery Plan
Last Chance townsendia Townsendia aprica	Threatened	Last Chance Townsendia Recovery Plan
Maguire daisy Erigeron maguirei	Sensitive	Central Utah Navajo Sandstone Endemics Conservation Agreement
Rabbit Valley gilia Gilia caespitosa	Sensitive	Central Utah Navajo Sandstone Endemics Conservation Agreement
Pinnate spring-parsley Cymopterus beckii	Sensitive	Central Utah Navajo Sandstone Endemics Conservation Agreement

The potential for impacts to other plant species that are of concern to the FNF are minimized because of restrictions prescribed in order to protect other resources. Table 3.11-3 lists the species and their entire known occupied habitat on the Forest with NSO protection.

Table 3.11-3: Sensitive Species with NSO Protection

SPECIES	STATUS	NSO
Barneby woody aster Aster kingii var. barnebyana	Sensitive	Greater than 35% slope, Ground Water
Nevada willowherb Epilobium nevadense	Sensitive	Greater than 35% slope
Bicknell thelesperma Thelesperma subnudum var. alpinum	Sensitive	Rare Plant, Ground Water, Greater than 35% slope
Fish Lake naiad Najas caespitosa	Sensitive	Recreation Developed Sites, National Recreation Trails, Perennial Streams, Springs, Lakes and reservoirs, Fisheries
Arizona willow Salix arizonica	Sensitive	Water Body and Perennial stream buffer

Table 3.11-4 shows only the species that have not been specifically discussed previously. If more than 95% of the species' occupied habitat falls within a development potential designation, it is listed as low, moderate or high.

Table 3.11-4: Sensitive and MIS Species and Development Potential

SPECIES	STATUS	DEVELOPMENT POTENTIAL
Dana Milkvetch	Sensitive	Low
Rydberg's milkvetch	MIS	Low
Paradox Moonwort	Sensitive	Low
Aquarius paintbrush	Sensitive	Low
Tushar Mountain paintbrush	Sensitive	Low
Creeping draba	Sensitive	Low
Angel cinquefoil	Sensitive	Low
Beaver Mountain groundsel	Sensitive	Low

There is no clear way of determining the potential direct and indirect effects to the following species. The known occupied habitats for these species fall within a variety of development potential areas with differing amounts of surface occupancy potentials.

Bicknell milkvetch has 66% of its known locations falling within moderate or low potential development areas. One third of the locations that are within the high development potential area are within a NSO.

Seven of the eight known Elsinore buckwheat sites fall within the high development potential area. Fifty percent of the locations are within a NSO.

Little Penstemon has no known locations that fall within the high development potential area. Approximately 64% of the known locations are within the moderate potential areas with the other 36% falling within the low development potential areas.

Close to 80% of Ward beardtongue locations on the Forest are in the high development potential area with 48% of those locations within a NSO.

Sixty six percent of Sevier townsendia known sites are in the high development potential area with 50% of those locations falling within a NSO.

Alternative C also has a CSU stipulation for known sensitive and MIS plant habitat. Pad development sites within one mile of known occupied habitat are subject to this stipulation, and drill pads may be moved up to ½ mile from occupied habitat.

In Alternative C the potential impacts to TES plant species would be minimal. The NSO areas would prohibit any impacts to known locations. There is the potential that new plant locations would be discovered during site specific analysis. The SLT&C provide some additional protections to TES plants. This action alternative would have “No Effect” on any population or individual federally listed plant species.

This action alternative will have “No Impact” on any individual or known habitat of the following Sensitive species: Aster kingii var. barnebyana, Cymopterus beckii, Epilobium nevadense, Gilia caespitosa, Najas caespitosa, Salix arizonica, Senecio castoreus, Thelesperma subnudum var. alpinum.

Alternative C “may impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species” for the following species: *Astragalus consobrinus, Astragalus henrimontanensis, Astragalus perianus, Botrychium paradoxum, Castilleja aquariensis, Castilleja parvula var. parvula, Draba sobolifera, Eriogonum batemanii var. ostlundii, Penstemon parvus, Penstemon wardii, Potentilla angelliae, Tonsendia jonesii var. lutea.*

Alternative D

Under this alternative all of the known TES and MIS plant populations on the FNF, as well as a one mile buffer around these locations, are under a NSO stipulation. Although there is the potential that new plant locations would be discovered during site specific analysis, the SLT&C provide some additional protections to TES and MIS plants.

This action alternative would have "No Effect" on any population or individual federally listed plant species. In addition this action alternative will have "No Impact" on any individual or known habitat of the Sensitive and MIS plants known to occur on lands administered by the FNF.

Cumulative Effects

The potential cumulative effects from this action and past, present and reasonable foreseeable future actions are presented in Table 3.11-5.

Table 3.11-5: Plant Species Cumulative Effects

Species	Status	Alt A	Alt B	Alt C	Alt D
San Rafael cactus	Endangered	No Effect	May Effect	No Effect	No Effect
Last Chance townsendia	Threatened	No Effect	May Effect	No Effect	No Effect
Maguire daisy	Sensitive	No Impact	May Impact	No Impact	No Impact
Barneby woody aster	Sensitive	No Impact	May Impact	No Impact	No Impact
Dana's milkvetch	Sensitive	No Impact	May Impact	May Impact	No Impact
Bicknell milkvetch	Sensitive	No Impact	May Impact	May Impact	No Impact
Paradox moonwort	Sensitive	No Impact	May Impact	May Impact	No Impact
Aquarius paintbrush	Sensitive	No Impact	May Impact	May Impact	No Impact
Tushar Mountain paintbrush	Sensitive	No Impact	May Impact	May Impact	No Impact
Pinnate spring-parsley	Sensitive	No Impact	May Impact	No Impact	No Impact
Creeping draba	Sensitive	No Impact	May Impact	May Impact	No Impact
Nevada willowherb	Sensitive	No Impact	May Impact	No Impact	No Impact
Elsinore buckwheat	Sensitive	No Impact	May Impact	May Impact	No Impact
Rabbit Valley gilia	Sensitive	No Impact	May Impact	No Impact	No Impact
Fish Lake naiad	Sensitive	No Impact	May Impact	No Impact	No Impact
Little penstemon (Aquarius penstemon)	Sensitive	No Impact	May Impact	May Impact	No Impact
Ward's Penstemon	Sensitive	No Impact	May Impact	May Impact	No Impact
Angell cinquefoil	Sensitive	No Impact	May Impact	May Impact	No Impact
Arizona willow	Sensitive	No Impact	May Impact	No Impact	No Impact
Beaver Mountain groundsel	Sensitive	No Impact	May Impact	No Impact	No Impact
Bicknell thelesperma	Sensitive	No Impact	May Impact	No Impact	No Impact
Sevier townsendia	Sensitive	No Impact	May Impact	May Impact	No Impact
Rydberg's milkvetch	MIS	No Impact	May Impact	May Impact	No Impact

The potential cumulative effects of all the alternatives are the same as the potential direct and indirect effects of the project. Past, present and reasonably foreseeable projects have had few to no impacts to the TES and MIS plants known to occur on the FNF. Any additional impacts from the proposed action will be minor and will not increase the impacts to TES and MIS plants to a higher level of significance.

The potential impacts from oil and gas development under Alternatives A, C & D, when added to past, present and foreseeable future actions would have "No Effect" on any TEP plant species. These Alternatives have been developed in a manner to have adequate protection from potential impacts.

Alternative B, if selected, "May Affect but not likely to adversely affect" Threatened and Endangered plant populations on the FNF. Although this alternative has more potential to affect these species, when added to the past, present and foreseeable future actions it does not increase the potential level of impacts to a higher level of significance.

Alternative B "may impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species" of all of the Sensitive and MIS plants known to occur on lands administered by the FNF. Although this alternative has more potential to affect these species, when added to the past, present and foreseeable future actions it does not raise the level of impacts to a higher level of significance. There would not be any cumulative effect from this action.

The potential impacts from oil and gas development under Alternatives A&D, when added to past, present and foreseeable future actions would have "No Impact" to the sensitive and MIS plants known to occur on lands administered by the FNF.

Alternative C, if selected, will have "no impact" on any individual or known habitat of the following Sensitive species: Aster kingii var. barnebyana, Cymopterus beckii, Epilobium nevadense, Gilia caespitosa, Najas caespitosa, Salix arizonica, Senecio castoreus, Thelesperma subnudum var. alpinum. Therefore, there will be no cumulative effects on these species.

Alternative C "may impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species" for the following species: *Astragalus consobrinus, Astragalus henrimontanensis, Astragalus perianus, Botrychium paradoxum, Castilleja aquariensis, Castilleja parvula var. parvula, Draba sobolifera, Eriogonum batemanii var. ostlundii, Penstemon parvus, Penstemon wardii, Potentilla angelliae, Tonsendia jonesii var. lutea.* Although this alternative has more potential to affect these species, when added to the past, present and foreseeable future actions it does not raise the level of impacts to a higher level of significance. There would not be any cumulative effect from this action.

3.12 AIR QUALITY

3.12.1 Introduction

Rationale for Use of Supplemental Information Reports 2 and 2A

While preparing their oil and gas leasing Environmental Impact Statements, the Dixie and Fishlake National Forests employed JBR Consultants to analyze and model the potential effects of oil and gas leasing on air quality and climate change. As a result, Supplemental Information Reports (SIR) 1, 1A, 1B, 2, and 2A were prepared to analyze the potential effects. Rationale intended to clarify and compare the differences in potential effects on climate change between the Dixie National Forest (DNF) and Fishlake National Forest (FNF) as presented in SIR-2 and SIR-2A was written and is contained in the administrative record (Hamilton 2012).
The following should be noted:

The FNF RFDS is based on the assumption that all potentially productive areas are open for leasing under standard terms and conditions, except those areas designated as closed to leasing by law, regulation or executive order. However, it is anticipated that all potentially productive areas would not be open for leasing under standard terms and conditions due to restrictions and stipulations that will likely be needed to conserve sensitive resources. (Supplemental RFDS – 4/22/2011).

The RFDS for the FNF estimated two plays or fields. Each field would have 2 to 3 pads with up to 5 wells per pad using directional drilling technology for a total estimated 30 wells.

The distance from Richfield, Utah to Salt Lake City, Utah is approximately 160 miles. The distance from Cedar City, Utah to Salt Lake City, Utah is approximately 250 miles. Therefore, the distance from Cedar City to Salt Lake City is approximately 34% further than from Richfield to Salt Lake City.

Both Forests are located in the same geographic area, experience similar climatic effects and have similar vegetation types and quantity. In summary, the effects of oil and gas leasing and development on the Fishlake would be slightly more than those of the Dixie. Comparatively, they would also be negligible on a national and global scale and minor on a state and regional scale.

3.12.2 Affected Environment

Air quality on the Fishlake N.F. is currently meeting all National Ambient Air Quality Standards (NAAQS). In general, the air quality within the Forest is considered good to excellent (AQI 2005).

The climate and climatic conditions found there are some of the major reasons for its very good air quality. Generally, the climate is dry with a high number of sunny days. Winds are generally from the southwest. Weather can change dramatically. Thunderstorms are common during the summer months. Daytime temperatures are warm, with cool nighttime temperatures. As moist air is forced to rise over the Canyon and Tushar Mountains and the Sevier Plateau, moisture falls as precipitation. With the Forest's mid-continent location, numerous canyons, plateaus, and mountainous terrain, it experiences wide temperature variations between seasons. Climates in the Forest also vary greatly with elevation. During winter and spring, precipitation can come in the form of snow, with a moderate to heavy snow pack accumulating in many of the higher elevations. By late spring, temperatures warm up in the lower elevations, while the mountain snowpack begins to melt. Summer brings warm temperatures to most areas with hot temperatures in the more desert-like, lower elevation areas. Afternoon thunderstorms are common from June through September. Thus, active mixing of air and average precipitation for Utah, results in low pollutant background values for the Forest.

An absence of major air pollution sources also results in low pollutant background values. There are coal fired power-plants at Huntington and Delta near the boundaries of the Forest. Emissions from these plants meet air quality standards. A few other small industries which also meet air quality standards are located nearby.

Visibility (Regional Haze) is a measure of how far and how well one can see. Parameters that affect visibility include sulfates, carbon particles and dust. The average natural visibility in the western U.S. ranges from 110 to 115 miles, with the current annual average of approximately 60 – 90 miles (Core 2001). Visibility within the western United States has shown general improvement. Recently, this trend has continued in southern Utah (National Park Service, 2007). From 1996 to 2005 Cedar Breaks National Monument, Bryce Canyon National Park and Zion National Park significantly increased their days with good visibility and the Trend in Haze Index on the clearest days significantly improved also. During this time period Zion and Bryce were below NAAQ standards for particulate matter $PM_{2.5}$ (Cedar Breaks did not report). Compared to the eastern U.S., the west has more carbon particles in the air. This is thought to be due to smoke emitted by agricultural forest and rangeland fires.

Greenhouse Gases -The effects of climate change and greenhouse gasses on resources in the project area can be reviewed in Appendix E of this EIS. The Appendix reports that anthropogenic (human induced) increases are the largest contributors to greenhouse gases. The largest percentage of greenhouse gas emissions in 2007 were carbon dioxide CO2. Amounts of carbon dioxide, methane, nitrous oxide and halocarbons in the air are increasing. Oil and gas activities emit carbon monoxide, nitrogen oxides, volatile organic compounds and sulfur dioxide that contribute to greenhouse gases and affect climate change. The Baseline Conditions (3.2.2 through 3.2.5) described in Appendix E – SIR2 page 30 - 38 would also be applicable to the FNF.

General Air Quality

The NAAQS are defined in the Federal Clean Air Act as levels of pollutants above which detrimental effects on human health and welfare may occur. There are seven criteria pollutants for the NAAQS: ozone (O_3), carbon monoxide (CO), nitrogen oxides (NO_x), sulfur dioxide (SO_2), particulate matter (PM) with aerodynamic diameter less than or equal to 10 microns and 2.5 microns (PM_{10} and $PM_{2.5}$), and lead (Pb). Regulations state that ambient air quality standards for NO_x, SO_2, and PM_{10} must not be exceeded at any time during the year in areas with general public access. Short-term standards for CO and SO_2 can be exceeded only once annually. Compliance with the 24-hour PM10 and $PM_{2.5}$ standards are based on the 98th percentile of 24-hour concentrations averaged over 3 years. Demonstrating compliance with the new ozone standard is described as the 3-year average of the annual fourth highest daily maximum 8-hour average at every ozone monitor being equal to or less than to the level of the standard. Based on these federal regulations, Utah has several non-attainment areas. Non-attainment areas, and the pollutant for which an area became nonattainment, are shown in Figure 3.12-1.

Specific NAAQ standards can be seen at http://www.epa.gov/air/criteria.html

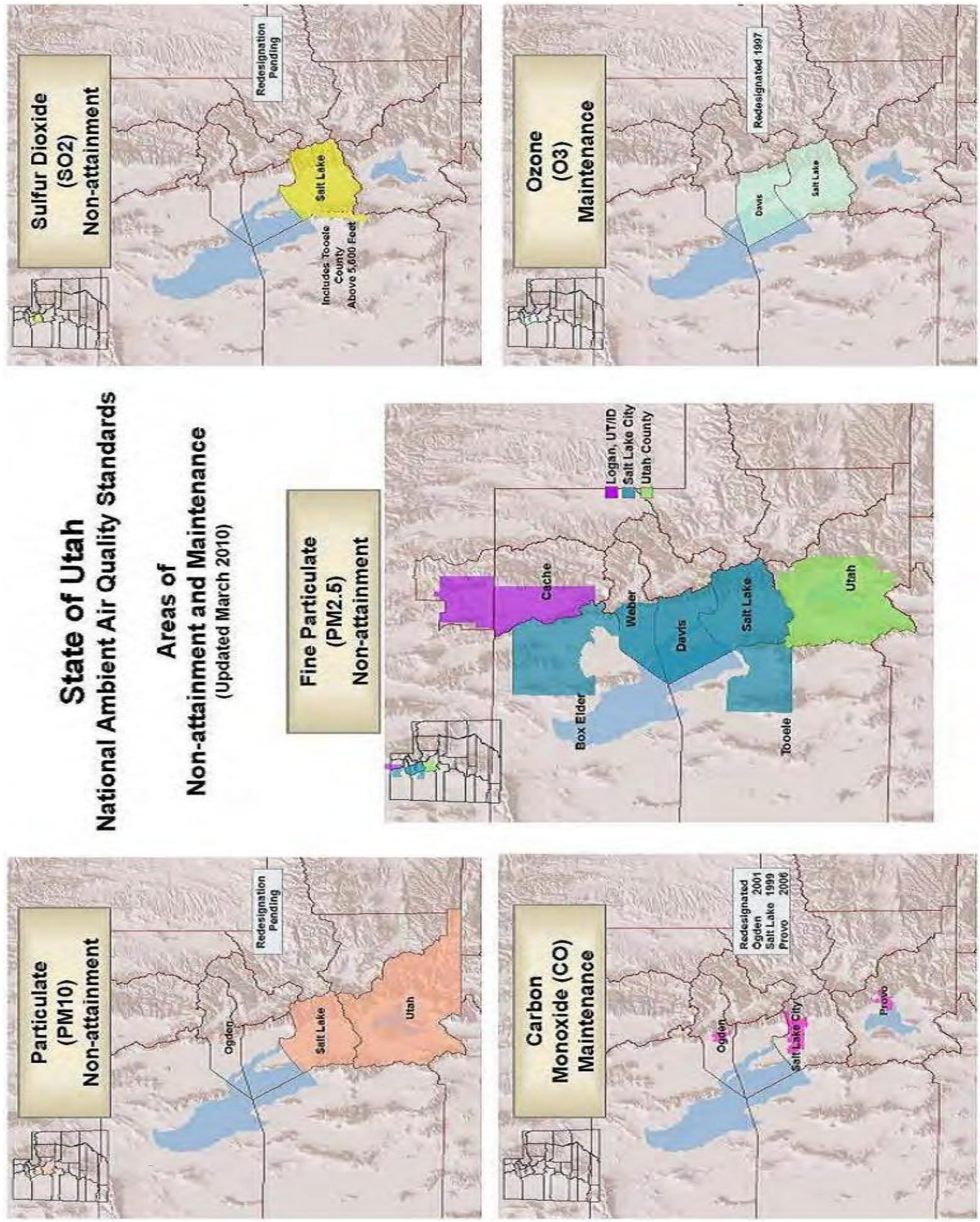


Figure 3.12-1 Non-attainment areas in Utah

Data Source: http://www.airquality.utah.gov.images/Maps/NONATTAINMENT_MAP.pdf

None of these non-attainment areas affect the analysis area. Utah County, which is non-attainment for PM_{10}, is approximately 30 miles from the northernmost portion of the Fillmore Ranger District of the Forest. There are portions of the Forest that lie near areas that have been closely reviewed and compared with the NAAQS. There are 16 separate airsheds within the State of Utah. The UDAQ, the EPA, and the Utah Smoke Management Plan (SMP) have designated the Forest area as Airsheds 2, 8, 10, 12, and 13, within the state of Utah. Utah Air Quality Control Rule 307-204 of the Air Quality Rules regulates the management of wild fires and prescribed burns. The purpose of the rules is to mitigate the impact on public health and visibility of prescribed and wild land fire.

Sensitive Areas

All areas of the State have been designated as either Class I or Class II for air quality. Pursuant to the Federal Clean Air Act, the National Parks (NP) are mandatory Class I areas. The rest of the study area has been designated Class II. The regulations allow a specific increase, or "increment," in pollution over and above the existing air quality "baseline" pollution levels. Facilities that may impact Class I areas may be allowed to produce small increases in pollution, while facilities that impact only Class II areas are allowed somewhat larger increases. However, any facility that may increase pollution concentrations in these areas may not cause a violation of the NAAQS. The impact from a source is determined by using EPA-approved air dispersion models. Table 3.12-1 shows the allowable increases of pollution to the ambient air environment of Class I and II areas. Allowable pollutant increase standards have not yet been established for 1 hour NO_2 and 1 hour SO_2. Prevention of significant deterioration (PSD) increments have also not been established for ozone, CO and Pb.

Table 3.12-1 Allowable Pollutant Increases in Class I and II Areas

POLLUTANT	PERIOD	CLASS I INCREMENT	CLASS II INCREMENT
Sulfur Dioxide	3-hour	25 µg/m3	512 µg/m3
	24-hour	5 µg/m3	91 µg/m3
	Annual	2 µg/m3	20 µg/m3
Nitrogen Dioxide	Annual	2.5 µg/m3	25 µg/m3
PM10 (Particulate Matter <10 microns)	24-hour Annual	8 µg/m3 4 µg/m3	30 µg/m3 17 µg/m3
PM2.5 (Particulate Matter < 2.5 microns)	24-hour Annual	Not established Not established	Not established Not established
µg/m3 = micrograms per cubic meter			

These allowable criteria pollutants (SO_2, NO_x, and PM_{10}) are also the precursors to secondary pollutants that can contribute to acid rain, visibility, and regional haze. Based on the designation status from the State of Utah and several federal agencies, there are five Class I areas and eleven —sensitive Class II areas that could be impacted by the Proposed Action. These identified Class I areas are located within the 100 kilometers (62 miles) from the study area. They include Bryce Canyon, Zion, Canyonlands, and Capitol Reef National Parks and Glen Canyon National Recreation Area. Table 3.12-2 presents Class I and Class II areas that should be considered when addressing impacts. Several roads are also listed as Scenic Backways or Byways, such as Fishlake (U-24), Gooseberry/Fremont (FR 124), Thousand Lake Mountain (FR 206), Boulder Mountain

(Hwy 12), Beaver Canyon (U-153), and Capitol Reef Country (Highway 24). Visibility and Regional Haze criteria for Scenic Backways or Byways have not been established.

Table 3.12-2 Sensitive Areas near the Analysis Area

FEDERAL CLASS I & II AREAS (UNLESS OTHERWISE SPECIFIED)	MANAGING AGENCY	CLASS CATEGORY	STATE	DISTANCE FROM FISHLAKE NF (MILES)
Bryce NP	NPS	Class Ia	UT	37
Zion NP	NPS	Class Ia	UT	60
Capitol Reef NP	NPS	Class Ia	UT	0
Cedar Breaks NM	NPS	Class IIa	UT	38
Tushar Mountain	USFS- FLNF	Class IIb	UT	0
Box Death Hollow WA	USFS- DNF	Class IIb	UT	22
Bullion Delano	USFS- FLNF	Class IIb	UT	0
Grand Staircase-Escalante NM	NP	Class IIa	UT	42
Deseret Peak WA	USFS -WCNF	Class IIb	UT	61
Mt. Timpanogos WA	USFS – UNF	Class IIb	UT	59
Mt. Nebo WA	USFS - UNF	Class IIb	UT	22
Canyonlands NP	NPS	Class Ia	UT	55
Ashdown Gorge WA	USFS – UNF	Class IIb	UT	36
Dark Canyon Primitive & WA	USFS -WCNF	Class IIb	UT	55
Glen Canyon NRA	NPS	Class Ia	UT	16
Deep Creek WA	BLM	Class IIb	UT	54

a NPS=USDI - National Park Service; NP=National Park; WA=Wilderness Area; NWR=National Wildlife Refuge; NRA=National Recreation Area; NM=National Monument
b USFS=USDA National Forest Service; WA=Wilderness Area; NWR=National Wildlife Refuge

3.12.3 Environmental Consequences

No ground disturbing activities or developments are authorized by this decision. This air quality analysis is a projection of what might occur if leases are purchased and developed. Unlike a regulatory evaluation for permitting a given facility design, when impacts are evaluated for compliance with the ambient air quality standards in the specific vicinity of the facility; the evaluation in this EIS discloses the potential impacts to air quality at different distances from a hypothetical, but representative, oil production facility, which could be located anywhere in the Forest.

Representative, known emission rates for oil exploration and production facilities were selected for air pollutant emissions in this analysis. Selection of these emission values were a collaborative effort of the Dixie and Fishlake National Forests, EPA (Region 8), and UDAQ. Air dispersion models, based on unit emissions, were developed to allow for interpolation of emissions. Air dispersion modeling runs using emissions from a typical operation (exploration or production) were performed to verify the accuracy and conservativeness of the unit emission tables. Further discussion of the analysis process is discussed in the Air Quality Modeling Report contained in Appendix D (Supplemental Information Reports 1, 1-A, 1-B and 1-C). Greenhouse gas emission factors used in the climate change discussion were taken from a variety of sources and are discussed in detail in Appendix D.

Development Scenario Modeling

The Fishlake N.F. considered two development scenarios. The first considered drilling 45 exploratory wells over the next 15 years. The second model consisted of one, 10 to 15-well field on the Forest. This scenario described two or three production pads with each pad hosting up to five wells each, using directional drilling technology and an offset distance of one-half mile. The scenario included 12 wells on three pads. Total actual ground disturbance including the discovery well, central production facilities pad, production pads, water disposal well, new access roads, reconstruction of existing roads, pipelines and power lines, and a truck loading facility is estimated at 122-acres. The area within the perimeter of the field including pads, pad access roads, and interior pipelines and power lines, and undisturbed areas between could vary, but is estimated at approximately 3.0 square miles using a well spacing of 160 acres (or ½ mile distance between down-hole well termini - directional drilling).

Table 4.5-1 of Appendix D – SIR1 page 5 documents the model emissions sources used to simulate emissions from this well field development scenario. Modeling analysis, on the ground considerations were added by distributing the model emission sources over three square miles. The sources were distributed in a manner consistent with the anticipated spread of the well field scenario at a conceivable location in the Dixie and Fishlake National Forests: Oil & Gas Leasing EISs, Air Quality Modeling Report JBR Environmental Consultants, Inc. (Appendix D), with variations in elevations across the development field and across the receptor network based upon actual topography in the modeled location. Figures in Figure 3.2-1 of Appendix D – Sir1 page 5, Figure 5.1-1 of Appendix D – Sir1 page 18, Figure 5.1-2 of Appendix D – Sir1 page 17, and Figure 6.0-1 of Appendix D – Sir1 page 19 provide visual representations of development scenario's and modeling interpretation.

Fugitive Emissions in the Development Scenario Modeling

Actual development scenarios would include fugitive sources of Volatile Organic Compounds (VOCs) and particulates. The development scenario model runs include area and/or volume sources to assess the impacts of particulate emissions from ground disturbance and criteria pollutant emissions from vehicular traffic. The onsite emissions were evenly distributed around the facility in the model, with concentrations relatively even across the area. This is considered conservative in this analysis, where the nearest receptors are 0.25 kilometers (0.155 miles) away, closer to the center of activity than some of the wells. The percentages of overall traffic emissions that occur within the project boundary, as opposed to outside that boundary, Dixie and Fishlake National Forests: Oil & Gas Leasing EISs, Air Quality Modeling Report JBR Environmental Consultants, Inc. (Appendix D) were estimated at the high end of the estimate range. Road and disturbed area emissions occurring outside the identified project area are included in the emissions inventory, but their impacts were not modeled because the effects of these kinds of emissions are typically localized and of short duration.

Effects Common to All Action Alternatives
A CSU stipulation for Air Resources would be applied for exploratory projects on all lands within 5 km of Class I Airsheds and for development and production projects within 60 km of all Class I areas (i.e., Bryce Canyon National Park, and Capital Reef National Park). This CSU is intended meet or exceed guidance in the Federal Land Managers Air Guidance document (USFS et al. 2008). The CSU lists various analyses and design measures beyond those in the Standard Lease Terms and Conditions that would be implemented to reduce impacts from connected actions on a lease.

As recommended in the associated reports, modeling results will be used to "screen" potential projects for acceptability with NAAQ standards. For example, Table 9.4-3 of Appendix D SIR-1 page 34 would illustrate if effects on air quality of the development of a proposed well at an elevation of 2500 feet above and 10 kilometers from a target airshed would meet federal regulations and AQRV impact thresholds.

No ground disturbing activities or developments are authorized by this decision. Under any alternative, impacts to air resources would only result if oil field exploration and construction activities, oil field development, operating and maintenance activities, and sustainable production occur. The amount of dust generated by these activities would depend on the soil type, moisture conditions, dust control efforts, and the amount of traffic on dirt or gravel roads. Vehicle exhaust emissions would primarily depend on the amount of traffic. Impacts to air resources would be dependent on the distance from the potential activities and their elevations. Further discussion of the impacts is covered in the Air Quality Modeling Report (Appendix D).

There is the potential for oil and gas exploration and development activities to encounter hydrogen sulfide gas in the subsurface. Hydrogen sulfide can be a component of petroleum and natural gas in widely varying concentrations and exhibits a range of toxic effects to human health depending on its concentration in the atmosphere. Releases of significant amounts of hydrogen sulfide are minimized through precautions normally taken by industry personnel, but serious accidents can potentially cause significant impacts to human health for several thousand feet from the location of the release. When hydrogen sulfide is known to be present at a facility, warning signs are posted, special vents or incinerators are installed on equipment, contingency plans are prepared, and all workers at the facilities receive special training on dealing with accidental releases of the gas.

Criteria pollutants that could be released during oil and gas exploration and development activities can contribute to acid rain impacts. The criteria pollutants sulfur dioxide (SO_2) and nitrogen oxides (NO_x) are precursors to acid rain, which is a result of chemical changes in the atmosphere. Acid rain could affect the pH of the lakes and the vitality of the vegetation in each of the ranger districts. Also criteria pollutant emissions could have an impact on visibility and regional haze. Regional haze is caused by fine particles in the air (emitted directly or formed as secondary pollutants formed from NO_x and SO_2 emissions) that settle out very slowly. Increased criteria pollutant particulate emissions resulting from well field development could affect the visibility of the entire forest.

Both large and small particulate matter can be released during combustion processes inherent with oil and gas development such as internal combustion engines. Fine particulate matter ($PM_{2.5}$) is chiefly comprised of five mass types: organic mass, elemental carbon (also known as soot or black carbon), ammonium sulfates, ammonium nitrates, and crustal materials (i.e., soil). Primary fine particulate emissions result from combustion processes (including fossil fuel combustion and biomass combustion that occurs in wild fires) and include black carbon. In general, however, black carbon and crustal materials comprise a relatively small proportion of the fine particulate mass suspended in the atmosphere. The largest constituents of fine particulate are usually organic mass, ammonium nitrates, and ammonium sulfates. Secondary particulates do not result from emissions of fugitive dust.

Oil and gas activities produce ozone precursor pollutants including VOCs and NO_x. Ozone concentrations could be affected not only near potential activities, but also some distance away because nitrogen oxides or volatile organic compounds could be transported by winds to areas where conditions are more favorable for ozone production. Ozone precursor emissions from a single source need to be substantial in quantity before photochemical modeling becomes a useful predictive tool for direct impacts of ozone formation due to the fact that these models are designed for broader regional-scale analysis and are “tuned” to cumulative, regional atmospheric chemistry. An independent photochemical modeling analysis was determined not to be appropriate for this analysis (see appendix D for more information). Ozone formation is also highly dependent on meteorological conditions, including temperature, wind speed, and solar radiation. Ozone in the lower atmosphere is harmful to human health and vegetation.

Some fine particulates ($PM_{2.5}$), particularly ammonium sulfate and ammonium nitrate particles, can also be formed in the atmosphere from the interaction of either SO_2 or nitrogen oxides or ammonium. These types of $PM_{2.5}$ particles are referred to as secondary particulates, while particles emitted directly from a source are referred to as primary particulates. Oil and gas activities and associated internal combustion engines can produce primary pollutants and these can form secondary pollutants in the atmosphere which could then contribute to air quality impacts nearby and down-wind. Impacts would be similar under any action alternative as the scenario described in the RFDS would be implemented.

Construction and Exploration Impacts

The primary potential emissions resulting from exploratory drilling activities predicted in the RFDS are NO_x, SO_x, and VOCs from engine exhaust, product management, and tank breathing losses. Construction of the well pads will also result in measurable emissions of PM_{10} and $PM_{2.5}$ (see Table 4.5-1 of Appendix D – SIR1 page 5). Assuming that connected actions to leasing do occur, exploratory and construction impacts would be localized and short term. Impact analyses for VOCs require regional photochemical modeling. There is no practical technical approach for estimating VOC impacts from an individual project or small series of projects; this must be performed on a regional basis when cumulative regional development activity indicates enough emissions to justify it. For this reason, this analysis focuses on the impacts of criteria air pollutants. However, under the cumulative impacts section of this document an assessment of region VOC and ozone effects has been recommended utilizing existing regional modeling simulations.

Based on the Utah Division of Air Quality (UDAQ) regulations and the Utah SIP, dust emissions cannot exceed 20 percent opacity, as verified by EPA Method 22 observations, at the leased property boundary. Emissions from predicted construction and exploration activities would not be expected to exceed Class I or Class II standards because of construction duration, low emission rates, existing good air quality, and dispersion. Additional BMPs for dust control might be needed when there is regular public access near the drilling site. With any industrial activity, owners and operators must comply with the Clean Air Act and the Utah Air Quality Regulations, which regulate both operations that cause air emissions and air emissions.

Table 3.12-3 Construction Emissions

SOURCE NAME	POLLUTANT	EMISSION RATE (G/SEC)
Natural Gas Exploration Flare	CO	0.053200
	NOx	0.009800
	PM10/PM2.5	0.000890
Well Pad Construction1	PM10	4.946E-7
	PM2.5	7.574E-8
Road2	PM10	0.002380
	PM2.5	0.000363

1 Values include well pad construction, construction traffic, drilling traffic, and test and completion traffic.
2 Values for roads, from Trinity Consultants (Trinity 2004)

Vehicle traffic volume estimates, which were used to derive road dust emission rates, were prepared consistent with the "Highway Freight Traffic Associated with Development of oil and gas Wells" document prepared in 2006 by Daniel Kuhn of the Utah Department of Transportation.

The evaluation of air resource impacts from the predicted exploration activities in the RFDS included the following activities:

Construction of 5.5-acre drilling locations - A diesel fuel-fired drill rig engine with emissions based upon the 13.5 tons NO_x per well reported in the WRAP Oil and Gas Emission Inventory prepared in December 2005 by Environ, and the 2005 Wyoming field survey from which that data was developed, with actual emissions adjusted downward to be compliant with recent tiered engine requirements, and SO2 emissions consistent with AP-42 assuming the 0.15 percent sulfur content in diesel scheduled to be required during the operational phase. The Western Regional Air Partnership (WRAP) study indicated the mean drilling time is approximately 90 days per well continuously around the clock except for maintenance. Therefore, the longer term average impact predictions effectively assume four wells drilled back to back in relatively close proximity.

Construction of 1.1 miles of new access roads - Support traffic to supply, maintain, and staff the drilling effort; and a low volume of flaring of natural gas during exploration, equal to 100 million standard cubic feet (Mscf) per year.

Impact analyses, under the assumption that all of the connected actions described in the RFDS would occur, were conducted for distances ranging from 0.25 to 200 km (124.3 miles) from the source and at seven receptor elevations that ranged from 2,500 feet above to 2,500 feet below the source. The highest receptor impacts occurred when the model receptors were at or near the same elevation as the source. Table 3.12-4 documents the maximum predicted criteria pollutants NO_2, SO_2, and PM_{10}/$PM_{2.5}$ concentrations (µg/m3) as well as the maximum visibility impairment impacts at a variety of distances, for the scenario where the receptors were at the same elevation as the source. The tabulated impacts represent the maximum impact at the given distance for any of the elevation scenarios. For the impact assessment of primary $PM_{2.5}$ PM_{10} impacts were used as a conservative assessment given that primary $PM_{2.5}$ is a subset of primary $PM_{10.}$

Table 3.12-4 Exploration Drilling Impacts

Criteria Pollutant	Period	Class I	Class II	Concentrations - Micrograms per meter cubed (mg/m3) at kilometers			
		Increment	Increment	1	5	10	20
SO2	1-hour	Not established1	Not established1	0.112	0.03	0.01	0.01
	3-hour	25 µg/m3	512 µg/m3	0.16	0.05	0.02	0.01
	24-hour	5 µg/m3	91 µg/m3	0.07	0.02	0.01	0.00
	Annual	2 µg/m3	20 µg/m3	0.02	0.01	0.00	0.00
NO2	1-hour	Not established1	Not established1	54.6	14.7	7.2	3.1
	Annual	2.5 µg/m3	25 µg/m3	10.1	3.39	1.63	0.77
PM10	24-hour	8 µg/m3	30 µg/m3	12.4	2.77	1.20	0.53
	Annual	4 µg/m3	17 µg/m3	3.09	0.69	0.30	0.13
PM2.5	24-hour	Undefined	Undefined	12.4	2.77	1.20	0.53
	Annual	Undefined	Undefined	3.09	0.69	0.30	0.13
AQRV	Metric	Increment	Increment	1	5	10	20
Deposition	NO2 Dep	0.005	kg/hect/yr	0.0262	0.0050	0.0020	0.0007
	SO2 Dep	0.005	kg/hect/yr	0.0001	0.0000	0.0000	0.0000
Visibility 3	Days Δdv >0.5	Less than baseline	NA	4	1	1	1
	Days Δdv >1.0	Less than baseline	NA	0	0	0	0

Data is based on maximum impact values listed in Appendix A of the modeling report (Appendix D).
1 Significant Impact Levels (SIL) for 1-hour NOx and SOx as of 9/2012 have not been established by EPA.
2 Perceived discrepancies exist between the 1 and 3 hour NOx and SOx concentration levels reported. This occurred because different air quality models were used. Rationale for the use of each model is disclosed in Appendix D.
3 Visibility threshold: FLAG recommends that federal land managers report a change in light extinction (Δdv) impact of 10 percent, and consider requesting further analysis if change in light extinction (Δdv) reaches 5 percent with any regularity.

The modeling results shown in Table 3.12-5 indicate that emissions from predicted exploration activities would comply with the applicable NAAQS for Class II areas at all distances shown when combined with reasonable regional background values. The results also indicate there could be potential problems with compliance with incremental degradation limits for Class I areas for NO_2 out to between 5 and 10 km (3.1 - 6.2 miles) and PM_{10} within 2 miles of the source. Nitrogen oxide deposition may also be a problem within 5 miles of the source. Air concentrations of 1-hour NO_x fall below the EPA defined significant impact levels (SIL) by ten kilometers; concentrations of 1-hour SO2are below the SIL at all distances from the source. Screening tables show that compliance with NAAQS would be assured with the background concentrations expected in potential development areas.

As articulated in the FLAG document (USFS et al. 2008), federal land managers have a responsibility to protect Air Quality Related Values (AQRVs), and in this respect, may consider whether emissions from a new or modified source may have an adverse impact on AQRVs and provide their comments to permitting authorities (States or EPA). Based on this information, all proponents of exploratory projects within 5km of a Class I area will be required to provide an additional AQRV analysis prior to project approval.

Production Field Development, Operating and Maintenance Impacts

The potential emissions resulting from oil field development activities predicted in the RFDS are NO_x, SO_2, and VOCs from the production facilities, and PM_{10} emissions from the operating and maintenance activities. The Air Quality Modeling Report developed generalized emissions from a 12-well oil field development scenario. Emission estimates in the Modeling Report were based on the equipment needed to support oil exploration and/or oil field development. Estimates in the report are conservative and utilized the following resources: Utah State Government's "Analysis of Emissions from O&G Wells in Utah", the O&G Emission Inventory Workbook for the Uinta Basin Study, information from existing oil field development on the Dixie and Fishlake National Forests, regional and national oil and gas field emission analyses, and EPA and industry emission factors to develop the emission estimates. Table 3.12-5 summarizes the emissions expected from a 12-well oil field in the FNF. Note that these are estimates only and will vary depending on the actual location of the predicted oil field, the geology of the producing formations, the quantity of fossil fuel present, and the specific equipment necessary to extract the fossil fuel resources found at the site.

Table 3.12-5 Production Field Development Emissions

Source	$PM_{10}/PM_{2.5}$ (lb/hr)	NO_x (lb/hr)	SO_2 (lb/hr)
Drill Rig Engine	0.26	8.47	0.01
Exploration Flare	0.00	1.10	0.00
Compressors	0.04	2.20	0.00
Heater Treaters	0.07	0.95	0.01
Dehydration Units	0.01	0.10	0.00
Well Pumps	0.97	13.2	4.10
Production Flare	0.00	2.45	0.00
On-site Roads and Fugitives	1.00	0.20	0.00
Total	2.36	28.69	4.12

Assuming the connected actions predicted in the RFDS occur, the density of well fields, well field characteristics, and the success of development will be factors that determine impacts from connected actions to leasing. As stated above with any industrial activity, owners and operators must comply with the Clean Air Act and the Utah Air Quality Regulations, which regulate both operations that cause air emissions and air emissions. During the pre-construction stage of any proposed well field development, a site specific air analysis that includes refined air dispersion modeling would be required.

Sustainable Production Impacts

The potential emissions resulting from sustainable production fields predicted in the RFDS are primarily NO_x, SO_2, PM_{10}, $PM_{2.5}$, CO, and CO_2 resulting from oil and gas production, and ongoing oil field operating and maintenance activities. The emission estimates in Table 3.12-5 for the predicted production field development would also apply to sustained production. The impacts of specific pollutants are evaluated based on elevation and distance from the hypothetical production field. Impacts resulting from oil field development are further discussed in the Air Quality Specialist Report, and in the Modeling Report. A summary of the impact analysis is presented below. For the impact assessment of primary $PM_{2.5}$, PM_{10} impacts were used as a conservative assessment given that primary $PM_{2.5}$ is a subset of primary PM_{10}.

The modeling for the hypothetical production field included the following activities that affect air quality:

- Construction of three 5.5-acre drilling locations;
- One diesel fuel-fired drill rig engine with emissions based upon the 13.5 tons NO_x and 3.5 tons SO_2 per well reported in the WRAP Oil and Gas Emission Inventory prepared by Environ, and the 2005 Wyoming field survey from which that data was developed, with actual emissions adjusted downward to be compliant with recent tiered engine requirements;

The WRAP study indicated the mean drilling time is approximately 90 days per well, around the clock. Therefore, the longer-term average impact predictions effectively assume four wells drilled back to back in relatively close proximity;

- Construction of five miles of new access roads;
- Support traffic to supply, maintain, and staff the drilling and pumping effort;
- Six 1.0 MMbtu/hr heater / treater separators, one at each well pad;
- Twelve diesel-powered, 100 HP well pumps to extract oil, one for each well; and
- One 0.5 MMbtu/hr dehydrator and one 500 HP compressor processing a low volume of natural gas at partial capacity.

Diesel-fired well pumps are assumed because the predicted development sites are expected to be remote from the electric power grid. Though a slight amount of natural gas production is included for conservatism, producible natural gas is not routinely expected and is not anticipated in sufficient quantity to power the well pumps. If sufficient natural gas was found to fuel the well pumps, well pump emissions would be reduced.

Impact analyses, under the assumption that all of the connected actions described in the RFDS would occur, were conducted for distances ranging from 0.25 to 200 km (124.3 miles) from the source and at seven receptor elevations that ranged from 2,500 feet above to 2,500 feet below the source. The highest receptor impacts occurred when the model receptors were at or near the same elevation as the source. Table 3.12-6 documents the maximum predicted criteria pollutants NO_2, SO_2, and PM_{10} concentrations (µg/m3) as well as the maximum visibility impairment impacts at a variety of distances, for the scenario where the receptors were at the same elevation as the source. The tabulated impacts represent the maximum impact at the given distance for any of the elevation scenarios.

Table 3.12-6 Sustainable Production Impacts

Criteria Pollutant	Period	Class I Increment	Class II Increment	Concentrations (mg/m3) at kilometers 1	5	10	20
SO2	1-hour	Not established1	Not established1	26.922	7.38	3.50	1.44
	3-hour	25 µg/m3	512 µg/m3	40.81	13.31	6.02	2.68
	24-hour	5 µg/m3	91 µg/m3	18.14	5.91	2.68	1.19
	Annual	2 µg/m3	20 µg/m3	4.53	1.48	0.67	0.30
NO2	1-hour			127.3	34.2	16.7	7.3
	Annual	2.5 µg/m3	25 µg/m3	23.54	7.90	3.79	1.79
PM10	24-hour	8 µg/m3	30 µg/m3	19.26	4.32	1.88	0.82
	Annual	4 µg/m3	17 µg/m3	4.81	1.08	0.47	0.21
PM2.5	24-hour	Undefined	Undefined	25.0	5.62	2.44	1.06
	Annual	Undefined	Undefined	6.25	1.40	0.61	0.27
AQRV	Metric	Increment	Increment	1	5	10	20
Deposition	NO2 Dep	0.005	kg/hect/yr	0.0610	0.0116	0.0047	0.0017
	SO2 Dep	0.005	kg/hect/yr	0.001	0.000	0.000	0.000
Visibility 3	Days ∆dv >0.5	Less than baseline	NA	23	22	23	16
	Days ∆dv >1.0	Less than baseline	NA	6	7	7	4

Data is based on maximum impact values listed in Appendix A of the modeling report (Appendix D).
1 Significant Impact Levels (SIL) for 1-hour NOx and SOx as of 9/2012 have not been established by EPA
2 Perceived discrepancies exist between the 1 and 3 hour NOx and SOx concentration levels reported. This occurred because different air quality models were used. Rationale for the use of each model is disclosed in Appendix D.
3 Visibility threshold: FLAG recommends that federal land managers report a change in light extinction (Δdv) impact of 10 percent, and consider requesting further analysis if change in light extinction (Δdv) reaches 5 percent with any regularity.

Modeled emissions for the case where the receptors are at the same elevation as the source indicates potential compliance problems with the Class I increment within 15 km vicinity for NO_2. The modeling results indicate potential compliance problems with the Class I increment within 5 mile vicinity for the 24 hour period for SO_2. Note that provincial background pollutant concentrations vary and need to be considered for all air dispersion modeling evaluations. One hour NO_x impacts for a receptor at the same elevation as the source, within one kilometer of the source conservatively estimated from the screening table are shown to approach but not exceed the NAAQs with anticipated background concentrations added in the immediate vicinity of development activity. However, 1-hour NOx impacts for all other distance/source-receptor elevation differences and all 1-hr SO_2 impacts are estimated by screening to be well below the NAAQs standards with anticipated background concentrations added in. Air impacts for both pollutants fall below the respective SILs beyond 20 km.

The modeling also indicated that these emissions would be less if the receptors are lower than the source and that the emissions would be in compliance with all increments for Class I and II areas.

The emission inventory for this analysis was conservative in that it assumed one new well was being drilled while the full field was operating, and also assumed that diesel-fired pumps were used at each well head. NO_2, SO_2, and visibility impacts would be decreased if either no well drilling occurred simultaneously with the operation of 12 wells, or if enough natural gas was recovered onsite to fuel the well pumps so that diesel-fired pumping would not be required. Further, NO_x, SO_2, and visibility impacts would be approximately 90 percent lower if electric power lines were built to power the oil production field and no fuel was needed to operate the well pumps.

Impact to Class I Areas

If exploration drilling were to occur on the Forest, as predicted in the RFDS, the air quality modeling for a single exploration well shows the need to perform a cumulative air quality impact analysis in the future for criteria pollutants if Class I areas exist within 5 km (3.1 miles) of the drilling location.

If a production field were proposed on the Forest, the 12-well production scenario in the Air Model, using a set of reasonable assumptions, shows the need to perform a future cumulative impact analysis for criteria pollutants if Class I areas exist within 55 km (34.1 miles) of the production field. As a result of possible impacts, Appendix A of the EIS provides lease stipulations that will compel development proponents to complete an additional air quality analysis for exploratory projects within 5km of any adjacent Class I area and for development projects within 60 km of an adjacent Class I area. Also, any project that will meet or exceed the total project emissions assumed within this EIS will be compelled to complete an additional air quality analysis.

If exploratory projects occur more than 5 km (3.1 miles) or production occurs more than 55 km (34.1 miles) away from a Class I area results of modeling showed that increases of pollutant levels would be within allowed changes and less than NAAQS given existing air quality attainment ratings on the Fishlake.

Impacts to Visibility and Deposition – FLAG

The visibility analyses for the exploration and well development analyses showed that isolated exploratory wells were not likely to have any significant impact. However, the development scenarios could have visibility impacts potentially reaching the FLAG limit of 1 deciview out to 35 kilometers (21.7 miles) for the Fishlake well development scenario. These analyses also indicate that the Federal Land Managers could request a future cumulative visibility impact analysis for receptors out to 50 kilometers (31 miles) for the 12-well development scenario if it were to be built.

Similarly, Federal Land Managers’ Air Group (FLAG) -recommended deposition impact thresholds for Class I areas could be reached out to 21.7 km (13.5 miles) for the 12-well development scenario. These estimates are driven by the assumption of diesel well pumps. If natural gas could be recovered in sufficient quantity to power the well pumps, the extent of potential visibility and deposition impacts would drop, probably by at least one third, mainly due to sulfur deposition. If electric power was available, emissions of pollutants affecting visibility impacts would be considerably lower than those used for the visibility impact analyses reported here. Comparably lower deposition impacts could be estimated using the screening tables (see Appendix D).

As a result of the proposed impacts, Appendix A of the EIS provides lease stipulations that will notify development proponents about the need to complete an additional air quality analysis for exploratory projects within 5 km of any adjacent Class I area and for development projects within 60 km of an adjacent Class I area. Also, any project that will meet or exceed the total project emissions assumed within this EIS will be compelled to complete an additional air quality analysis. If exploratory projects occur more than 5 km (3.1 miles) or production occurs more than 55 km (34.1 miles) away from a Class I area results of modeling showed that impacts to visibility and deposition would be within allowed requirements of FLAG.

Greenhouse Gas Emissions Impacts

Greenhouse gas emissions could increase if oil and gas activities on the FNF occurred as predicted in the RFDS. Because there are no regulatory standards for comparison, these potential increases in greenhouse gases are compared to those at the state, national, and global scales. An increase in greenhouse gas emissions as a result of connected actions to leasing as predicted in the RFDS may also contribute to the global concentration of greenhouse gases that affect climate change. If all oil and gas activities that are predicted in the RFDS do occur, these activities could emit greenhouse gases into the atmosphere. The specific oil and gas activities that could contribute to these emissions are listed below:

Exploration drilling

- Production operations- drilling and pumping
- Transportation of crude oil from field to refinery
- Refining of crude oil into final product
- Transportation of final product to end user
- End use of product

Emissions from seismic exploration are not analyzed due to the relatively small contribution of these emissions to the total, and because seismic exploration could occur outside of the action alternatives. Including emissions from refining, transportation of refined product, and product end use is a conservative impact estimate because these emissions may occur regardless of the product source in order to satisfy current and future market conditions, and it could be argued that these actions are not necessarily related to oil and gas production on the FNF.

Total emissions estimates for each predicted activity are summarized in Table 3.12-7. Emissions are reported in metric tons of Carbon Dioxide Equivalent (CO2e) which is the standard unit of measure established by the EPA for Greenhouse Gas (GHG) emissions. Non- CO2 gases were converted to CO2e by multiplying by the Global Warming Potential for each gas.

Table 3.12-7 Estimated Emissions (Metric Tons of Carbon Dioxide Equivalent)

Oil and Gas Activity	CO_{2E}
Exploration	7,495
Production	58,214
Transportation of Crude	2,161
Refining	28,286
Transportation of Refined	868
Product End Use (off-site)	268,312
TOTAL	365,336

As discussed in Appendix E, CO_2 emissions from predicted oil and gas activities on the Fishlake N.F. (i.e., connected actions to leasing) could increase U.S. and world CO_2 emissions. At the national and global scales, this would be a negligible impact. On a state scale, CO_2 emissions from connected actions on the Fishlake would constitute a minor increase over CO_2 emissions for Utah in 2007. It should also be noted that this GHG emission estimate for connected actions has included emissions from refining, transportation of refined product, and product end use. This is a conservative impact estimate because it could be argued that the emissions from the refinery and later activities are not connected actions to potential Fishlake N.F. oil and gas production and may occur regardless of the product source in order to satisfy current and future market conditions.

Greenhouse gas emissions from potential oil and gas activities would incrementally contribute a relatively small amount to the total volume of greenhouse gases in the CEA and consequently could be responsible for an increment of the predicted effects of climate change discussed in Appendix E. This incremental impact from connected actions to leasing on the FNF would be negligible to minor and its duration would likely be long term. Climate change effects are global and cumulative in nature, thus the main discussion of climate change impacts with regard to air resources can be found under Cumulative Effects (Appendix E page 38).

Table 3.2-15 summarizes the information in Appendix E Sections 3.2.1 through 3.2.5, showing total CO_2 emissions for the Fishlake N.F. Oil and Gas Activities, Utah, the seven-state region in Section 3.2.3, the United States, and the World. Data are for CO_2 emissions only and have the same caveats and conditions as described for the tables from which they are derived.

Table 3.12-8 Summary Table

IPCC REGION	CO2 1995 (MMT CO2)	CO2 2000 (MMT CO2)	CO2 2007 (MMT CO2)
Fishlake NF Oil and Gas Activities	----	----	0.365 (Predicted)
Utah	35.40	63.78	69.23
Region (7-State)	---	---	---
United States	5,323.97	5,860.38	5,902.75
World Total	22,284.01	24,010.66	30,377.31 (2008)

The Impacts Analysis (Section 4.0 of Appendix E – SIR2 pages 38 through 39) and the Foreseeable Future Responses (Section 5.0 of Appendix E – SIR2 pages 40 through 46) apply to effects associated with Fishlake Oil and Gas activities and emissions assuming all connected actions to the leasing decision were to occur.

Direct Ozone Impacts

The reasonably foreseeable development scenarios analyzed within this EIS document produce ozone precursor emissions that are extremely limited in scale. Additionally, impacts associated with atmospheric ozone are typically regional in nature and are related to the movement and aggregation of precursor emissions from multiple regional sources. As a result, the impacts associated with ozone will be addressed under the Cumulative Effects Section of this document.

Impacts by Alternative

With the exception of Alternative A, estimated changes to ambient conditions (Measurement Indicator #1) and NAAQS exceedances (Measurement Indicator #2) would be the same under all alternatives. Changes in visibility (Measurement Indicator #3) compared to natural background conditions would be the same under all alternatives except Alternative A. Increases in GHG emissions (Measurement Indicator #4) would be the same for all alternatives, with the exception of Alternative A, because the action alternatives do not differ in terms of what activities are predicted under the RFDS. Impacts by alternative are thus the same and as described in Section 3.12.3.

Cumulative Effects

Description of Cumulative Effects Area

The Cumulative Effects Area (CEA) for air resources is portions of Airsheds 2, 8 (excluding Salt Lake and Utah Counties), 10, 12, and 13 as described by the UDAQ, EPA, and Utah SMP that is within 100 km of the Fishlake Boundary. Deseret Peak and Mt. Timpanogos are also excluded. Within the CEA are five Class 1 Areas and nine sensitive Class II areas that may be impacted by connected actions to leasing. Climate change effects are discussed on national, regional, and state levels (by reference, in Appendix E), although climate change effects are actually global in nature.

Rationale

Impacts to air quality would be within the immediate area of the Fishlake NF and the Forest designated airsheds. Air Quality impacts could extend past the borders of the Forest and designated airsheds impacting regional haze and visibility.

Past, Present, and Reasonably Foreseeable Future Actions

The lands within the CEA are mostly administered by federal agencies and actions on these lands were, are, or will be subject to NEPA.

Existing activities on the FNF that contribute to air quality emissions and greenhouse gases include motorized vehicle use, heating and powering of facilities, residential heating sources, timber harvesting, and wildfires as well as prescribed burns. The residential heating sources are considered minor and insignificant sources. These activities result in emissions of NO_x, CO, VOCs, $PM_{2.5}$, and PM_{10}. These activities have occurred, are occurring, and will continue to occur into the foreseeable future. Foreseeable future responses to climate change are discussed Section 5 of Appendix E.

Past oil and gas activity within the CEA has been relatively low. There are two producing fields, the Covenant Field located approximately 2 miles south east of Sigurd, Utah and the Providence Field located approximately 20 miles north west of the Covenant Field. According to BLM database records (LR2000) as of 2012, there are 18 authorized leases and 3 pending leases where all or part of the lease is within the boundaries of the FNF. These leases occur along the boundary throughout the Forest. About half of the leases occur within the Sevier Valley near the town of Richfield and the other small communities located there. There are numerous authorized and pending leases on adjacent and private and public land. Prior to the early 2000s exploratory wells were drilled on the Fishlake and subsequently capped. Current oil and gas activities result in NO_2, SO_2, $PM_{2.5}$, PM_{10}, and CO emissions. The Covenant Oil Field is predominately electrified.

In addition to oil and gas activity, there are numerous small minerals activities managed on public lands; these mineral activities are usually small operations (less than 5 acres) and primarily target materials such as clay, pozzolan and other mineral materials and gold, and silver. There is also one geothermal project that is in the planning and permitting stage located a few miles south of Cove Fort Utah. Mining activities result in PM_{10} emissions with lesser amounts of NO_x and CO.

All of the above types of activities and development are expected to continue to some degree on the Forest and within the CEA into the foreseeable future. ATV use will continue to trend upward. The use of prescribed fire and mechanical fuel treatments are also anticipated to increase over the next 5 to 10 years. The amount burned by prescribed fires will likely increase to over 10,000 acres per year in the near future. Most prescribed burns have minor and short-term effects on air resources in the CEA. The Utah Smoke Management Plan states that prescribed burns will not cause or significantly contribute to daily $PM_{2.5}$ or PM_{10} impacts or violate NAAQS. Further, an increase in the number of prescribed fires and mechanical fuel treatments should ultimately lead to a decrease in the number of large, catastrophic fires, thus reducing the resulting PM, $PM_{2.5}$, and PM_{10} emissions associated with those fires. Wildfires may increase in frequency in the CEA, however, due in part to climate change (discussed in Appendix E).

Timber harvesting will continue to be a part of the management goals of the forest. The existing mining activities are expected to continue and more exploratory wells may be drilled. Existing forests in the CEA will continue to serve as carbon dioxide sinks/storage.

Currently, there are several proposed or existing power plants or small industrial facilities within and surrounding the CEA. Multi-source, short, and long range, multi-pollutant air dispersion modeling would have to be conducted to determine cumulative effects and intensity associated with the measurement indicators. With the information provided we cannot make assumptions about existing and preexisting sources in the CEA.

Cumulative Effects

Under any alternative, surrounding sources, population growth, vehicular traffic, and proposed coal-fired power plants in the general area could affect the Forest air resources now and in the foreseeable future.

Cumulative effects to air resources would not vary by alternative, except for Alternative A. Alternative A would not result in oil and gas-related emissions on the Forest. Thus, the remaining cumulative effects discussion pertains to all action alternatives (Alternatives B, C, and D).

Impacts of oil field development and sustainable production, if these activities occurred as predicted in the RFDS, would be long term and would vary greatly depending on how many fields are developed, the density of the field, and oil productivity. Presumably, with current air quality regulations, permitting, and periodic testing requirements, the impacts would be controlled if a source emits more than five tons per year of any Criteria Pollutant. The Modeling Report (Appendix D) is a proportional-based estimate of emission and visibility impacts that can be applied to a variety of scenarios using the tables found there in. Emissions from a proposed well field development may have to be modeled prior to exploration or development to comply with applicable stipulations and regulatory standards. Air dispersion modeling, using an approved EPA model and protocol, should be used to determine whether the allowable emissions result in NAAQS or Class I visibility exceedances. In addition, increased NO_2 and SO_2 emissions from both the predicted oil field-related activities and nearby permitted sources could contribute to acid rain deposition. Based on the emission estimates, an individual well field would not cause acid range deposition. However, numerous well fields along with regional coal- fired power plants could cumulatively impact the forests, mountain lakes, and vegetation with acid rain. Emissions from well field production also include ozone precursors ($PM_{2.5}$, PM_{10}, VOC, and NO_x) and could cumulatively contribute to regional haze and visibility issues within the Forest boundaries and Class I areas.

Ozone

Unlike other atmospheric pollutants, ozone is not primarily emitted into the atmosphere. Ozone is produced in the atmosphere as a result of combining precursor pollutants with solar radiation. These precursor pollutants can reside in the atmosphere for significant amounts of time and travel over significant distances. As a result, ozone impacts are best assessed on a regional scale, accounting for the precursor pollutant emissions from all available sources within a reasonable distance. Such an analysis should account for the emission and modeled transport of ozone and its precursors as well as the modeled atmospheric chemistry that would result from their interaction.

To complete a modeling analysis of this complexity was found to be beyond the economic limitations of this leasing EIS project. As a result, the USFS has developed an ozone analysis based on the best currently available "scientifically credible" evidence. The analysis, which was based on existing regional modeling simulations, also describes the relative completeness of the information available as well as the potential shortcomings of the available modeling data. To ensure that the requisite "hard look" was completed under NEPA, the analysis was completed in keeping with 40 CFR Section 1502.22.

Given that a novel photochemical modeling analysis could not be reasonably completed for a cost that would not be considered exorbitant, the USFS acknowledges that the assessments of ozone impacts on both a direct and cumulative level are potentially incomplete.

With ambient ozone data indicating that regional ozone has been increasing throughout the State of Utah, particularly in regions with oil and gas development, the issue of ozone impacts is important to the determination of overall adverse impacts associated with this EIS. As a result, the USFS has undertaken an assessment of existing scientifically credible evidence that would be able to bound the potential regional impacts associated with ozone concentrations. Given that potential future ozone impacts are best predicted by the use of a photochemical modeling analysis, the initial assessment focused on the availability of such modeling analyses. The assessment concluded that the most recent, peer-reviewed, photochemical modeling analysis which included the project area within its modeled domain was the Uinta Basin Air Quality Study. As a result, this modeling simulation was selected for use in assessing total ozone impacts for this EIS leasing project.

The Uinta Basin Air Quality Study (UBAQS) was initiated in 2008 and was completed in June 2009 (IPAMS 2009). The study, funded by the Independent Petroleum Association of the Mountain States (IPAMS), sought to assess the regional air quality impacts of oil and gas production on the

Uinta Basin in Utah. Although the study was targeted to assess impacts in the Uinta Basin, the domain of the project was sufficiently large to allow assessments of air quality in regions throughout much of Utah.

UBAQS sought to assess the cumulative change in air quality from the regional expansion of oil and gas resources. In order to develop this assessment, primary and precursor emissions were developed for two modeled scenarios. These scenarios, occurring in model year 2005/2006 and 2012, included recorded (for 2005/2006) and reasonably foreseeable (for 2012) emissions from all sources that resided or would reside within the model domain. Proposed oil and gas related sources for both modeled scenarios were sourced from regional and sub-regional emissions assessments. They utilized best available information to determine spatially representative oil and gas emissions. These emissions were then extrapolated forward in time to account for growth of oil and gas production throughout the domain for the 2012 scenario.

Emissions developed for both the base year (2005/2006) and future years (2012) were modeled utilizing the Community Multi-Scale Air Quality Model (CMAQ). EPA guidance for projecting future 8-hour ozone concentrations recommends using the model in a relative sense to scale current observed 8-hour ozone Design Values. In order to perform this scaling operation EPA developed the Modeled Attainment Test Software (MATS) tool that uses modeling results, observed 8-hour ozone Design Values to project 8-hour ozone concentrations that reflect the change in emissions from a base case to an alternative emissions scenario.

For the UBAQS, the MATS tool was used to assess the effects of oil and gas development activities as well as regional emissions in the modeling domain on 8-hour ozone. The MATS tool performs 8-hour ozone Design Value projections at existing monitoring sites for comparison with the 8-hour ozone NAAQS. Additionally, the MATS tool has a capability to perform an Unmonitored Area Analysis (UAA) that performs a spatial interpolation of the current year observed 8-hour ozone Design Values using the ozone concentration gradients calculated from the gridded model base year outputs.

Because the nearest existing ozone monitoring location to the FNF is located in Canyonlands National Park, approximately 65 miles to the east, the UAA developed in the UBAQS was used to provide an assessment of impacts associated with this EIS. Figures 3.12-2, 3.12-3, 3.12-4, and 3.12-5 below present the current and future year predicted 8-hour ozone design values for the entire UBAQS modeling domain when using modeled meteorological conditions from base years 2005 and 2006 respectively. Figures 3.12-6 and 3.12-7 present the projected increase or decrease in design value from the base to the future projection year. Depending on the current year meteorological inputs used for the modeling simulation, the area weighted average for the regions managed by the FNF. indicate current and future year 8-hour ozone design values that are at or near the existing 8-hour ozone NAAQS.

Specifically, for the 2005 meteorological inputs, the current and future year 8-hour design values range from 70-86ppb depending on the sub-region of the forest that is analyzed. For the 2006 meteorological inputs, the current and future year 8-hour design values range from 70-75ppb depending on the sub-region of the forest that is analyzed. Given the diversity in predicted impacts associated with meteorological inputs the predicted impacts are best reviewed in relative terms, i.e. one should review the predicted change in ozone concentrations due to emissions increases rather than due to meteorological inputs. Figures 3.12-6 and 3.12-7 below quantify just such an analysis. Depending on the particular sub-region of the forest, design values associated with the impact of potential future oil and gas development, as well as regional growth, is forecast to remain stagnant for much of the Forest with only a slight increase or decrease in some regions. Both growth and contraction of the region's projected 8-hour ozone design values are constrained to less than one part per billion in ambient air. As a result, the predicted impacts from the UBAQS suggest that regional ozone in the project area is unlikely to vary significantly from its current monitored conditions. When combined with monitored ambient ozone data from Washington County, UT. The UBAQS study suggest that the ozone impacts in the region are likely to remain below the existing ozone NAAQS.

Specifically, when recent official annual ozone data (observation year 2011) was released for the UDEQ ozone monitoring station at 1215 N. Lava Flow Drive, Santa Clara, Washington County, UT, the maximum 8-hour average for the entire reporting year was 71 ppb and the average was 70 ppb. Ozone data for the same year from a monitoring station at 351 W 2500 E, Price, Carbon County, UT the maximum 8-hour average for the entire reporting year was 73 ppb and the average was 70 ppb. These levels of maximum 8-hour ozone would suggest that a shift of only 1ppb, as predicted by the UBAQS study would not be likely to produce ozone levels that would even approach the existing ozone NAAQS.

These findings support that the connected actions to leasing described in this EIS will not result in a significant impact on regional cumulative ozone concentrations. Although the UBAQS represents the best available peer-reviewed photochemical modeling simulation which includes the EIS project region, it should be noted that the UBAQS does have potential shortcomings that are recognized by the USFS. To ensure that all available information is provided with regard to the existing scientific evidence available for review, the following items should be noted in regards to the use of the UBAQS.

1. There is not sufficient air monitoring data in the UBAQS modeling study, because at the time the study was performed, this data was not available for the area.

2. The UBAQS primary modeling domain was subdivided into 12-km grid squares, instead of the preferred 4-km grids, for a large portion of central and eastern Utah and western Colorado. The accuracy of modeled predictions from a 12-km or greater grid spacing for areas of complex terrain has tended to be suspect.

3. The UBAQS oil and gas focus area, and associated emission inventory within that area, comprised the six-counties of the Uintah Basin. The Fishlake N.F. occurs outside this focus area, but was covered within the overall UBAQS statewide modeling domain.

4. The modeling domain was subdivided into 12-km grid squares to provide additional detail on the locations of existing oil and gas emission sources. It is not clear how hypothetical emissions from the Fishlake N.F. oil and gas leasing scenarios were reflected in the UBAQS study.

5. The UBAQS future modeled predictions for year 2012 are not particularly useful for project development activities occurring beyond the year 2012.

Given that the UBAQS does contain shortcomings, the USFS feels that its use is appropriate only in the limited exploration and development scenarios inherent to this EIS. Should proposed oil

and gas activity exceed the bounds of the scenarios reviewed in this analysis additional ozone analyses need to be completed to affirmatively defend the finding of this EIS. The specific requirements for additional analysis are included in the air quality CSU stipulation.
Regional VOC and ozone effects monitoring is recommended utilizing existing regional modeling simulations.

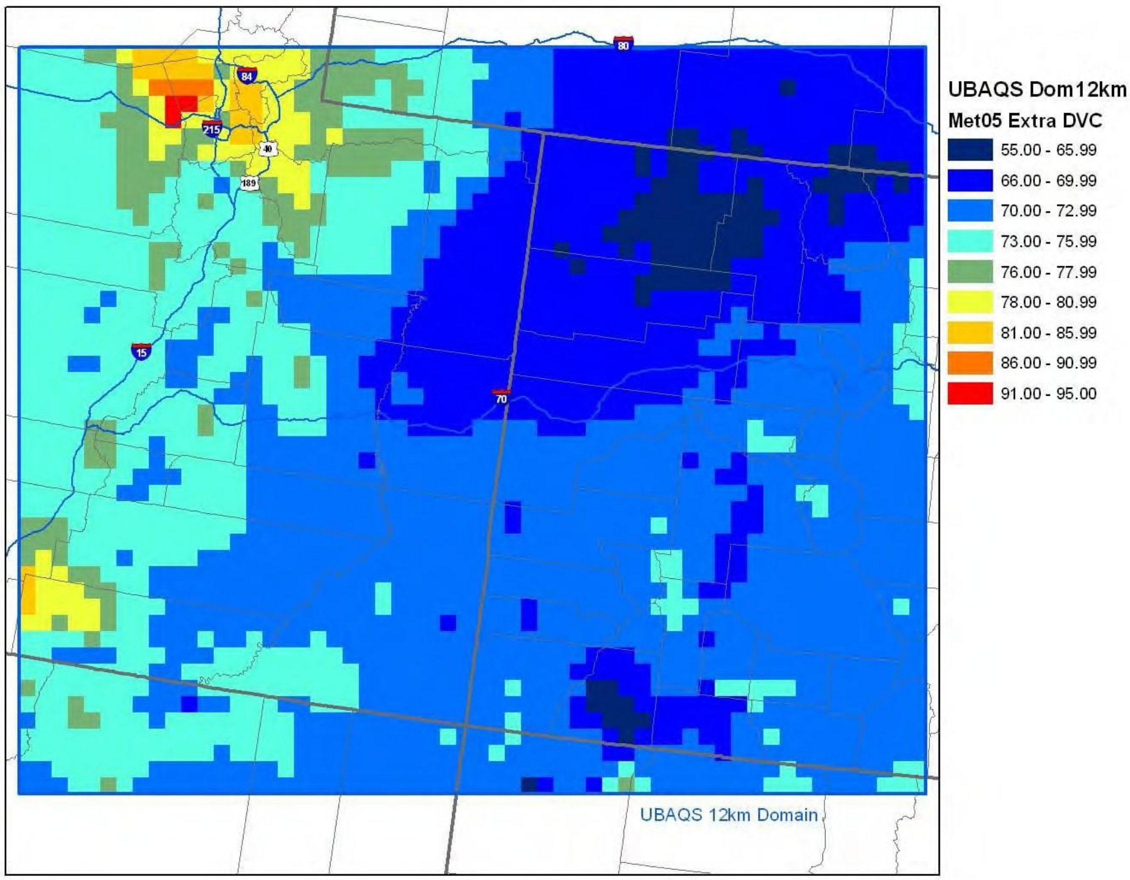


Figure 3.12-2 Current year 8-hour ozone Design Values (DVC) from the enhanced MATS unmonitored area analysis

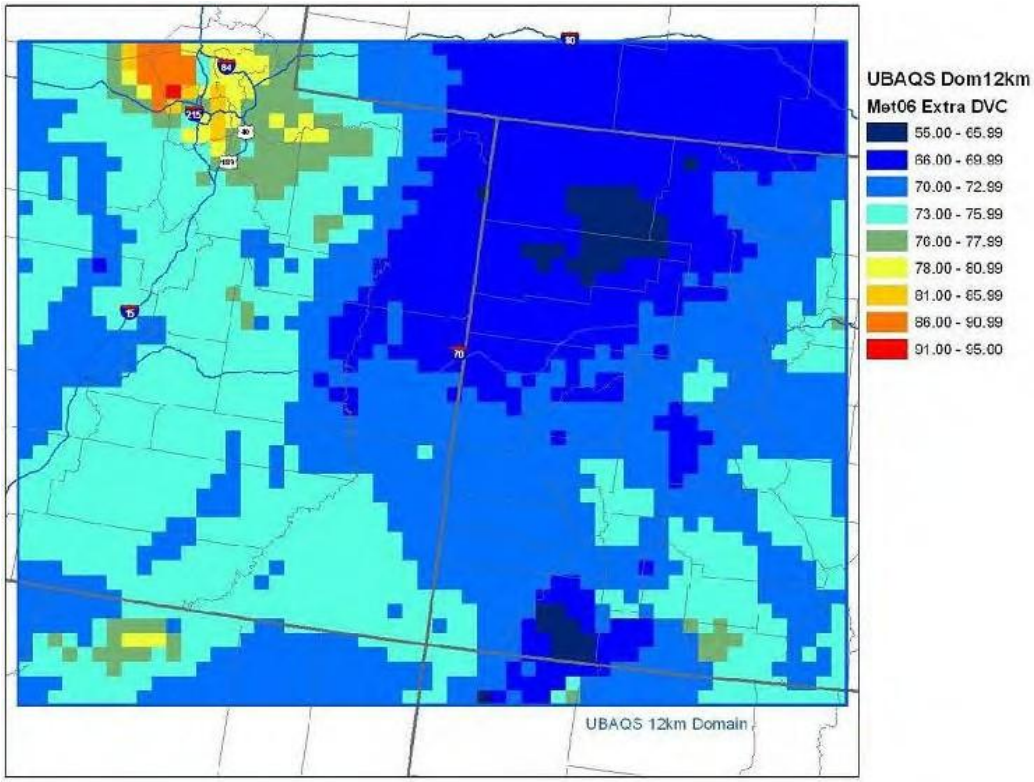


Figure 3.12-3 Current year 8-hour ozone Design Values (DVC) from the enhanced MATS unmonitored area analysis

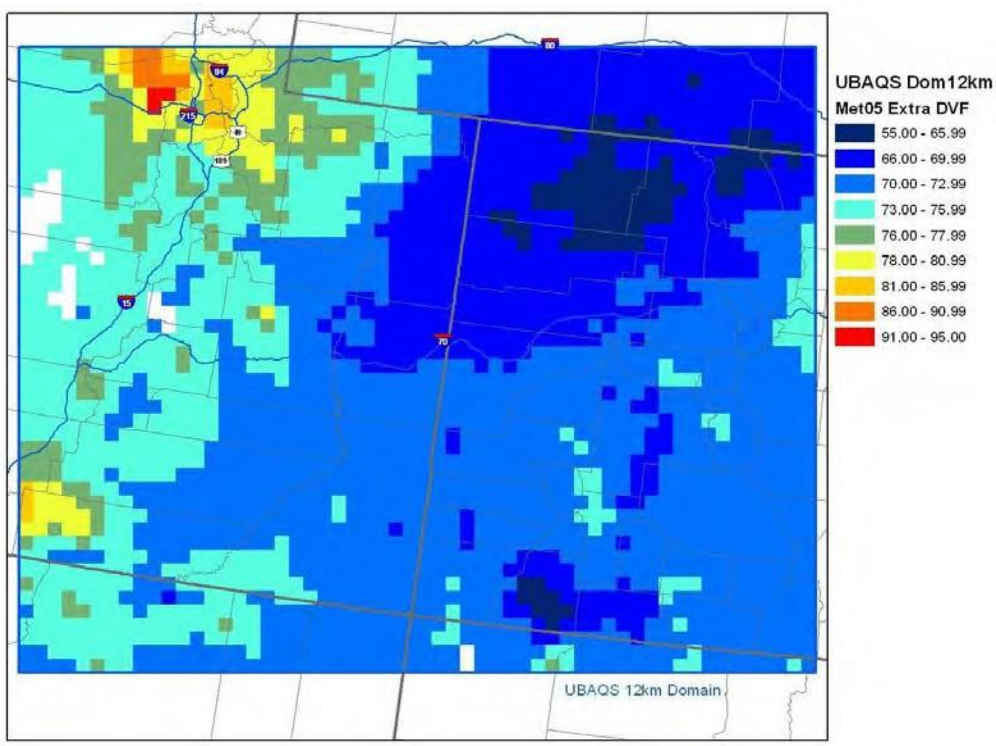


Figure 3.12-4 Projected 2012 8-hour ozone Design Values (DVF) from the enhanced MATS unmonitored area

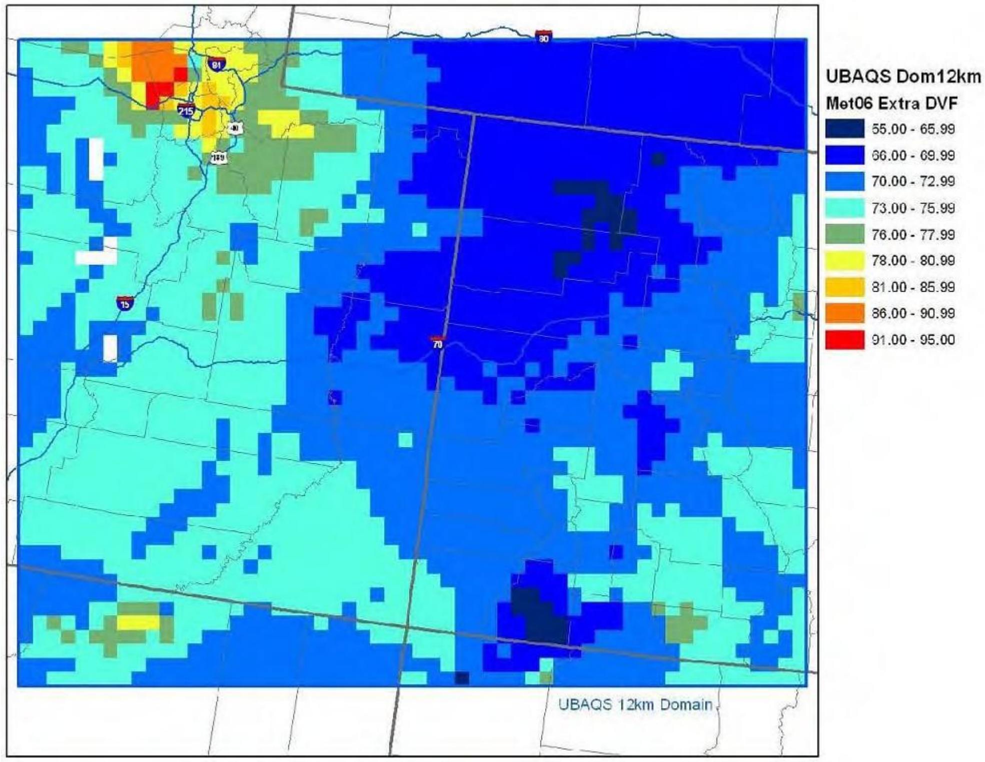


Figure 3.12-5 Projected 2012 8-hour ozone Design Values (DVF) from the enhanced MATS unmonitored area

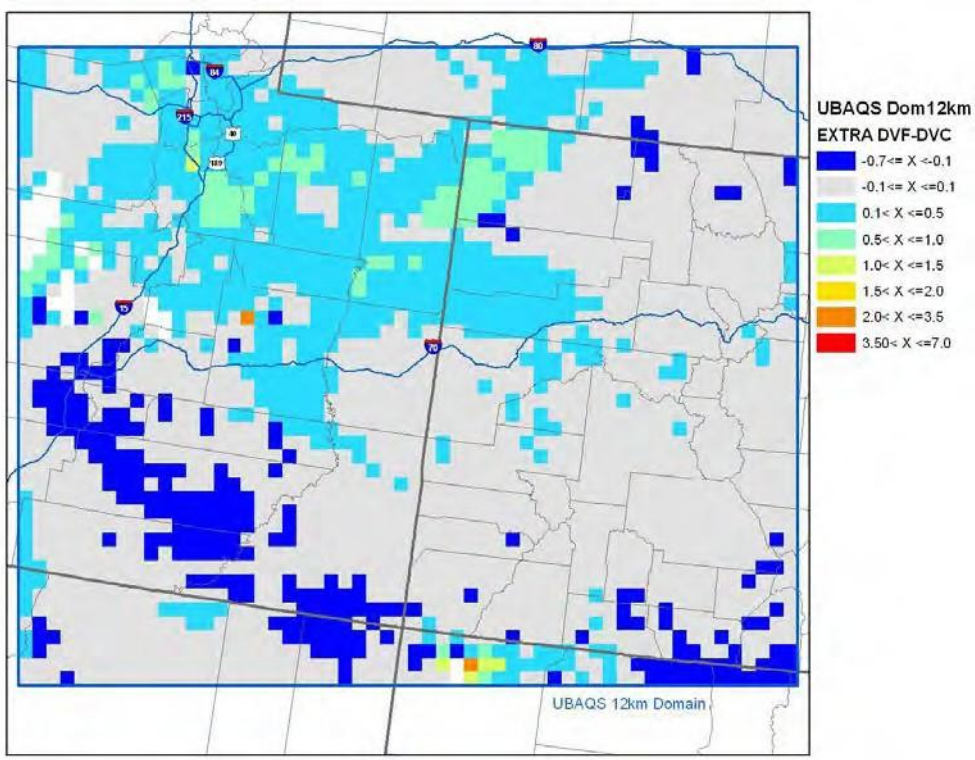


Figure 3.12-6 Differences in the projected 2012 (DVF) and current year (DVC) 8-hourozone Design Values from the

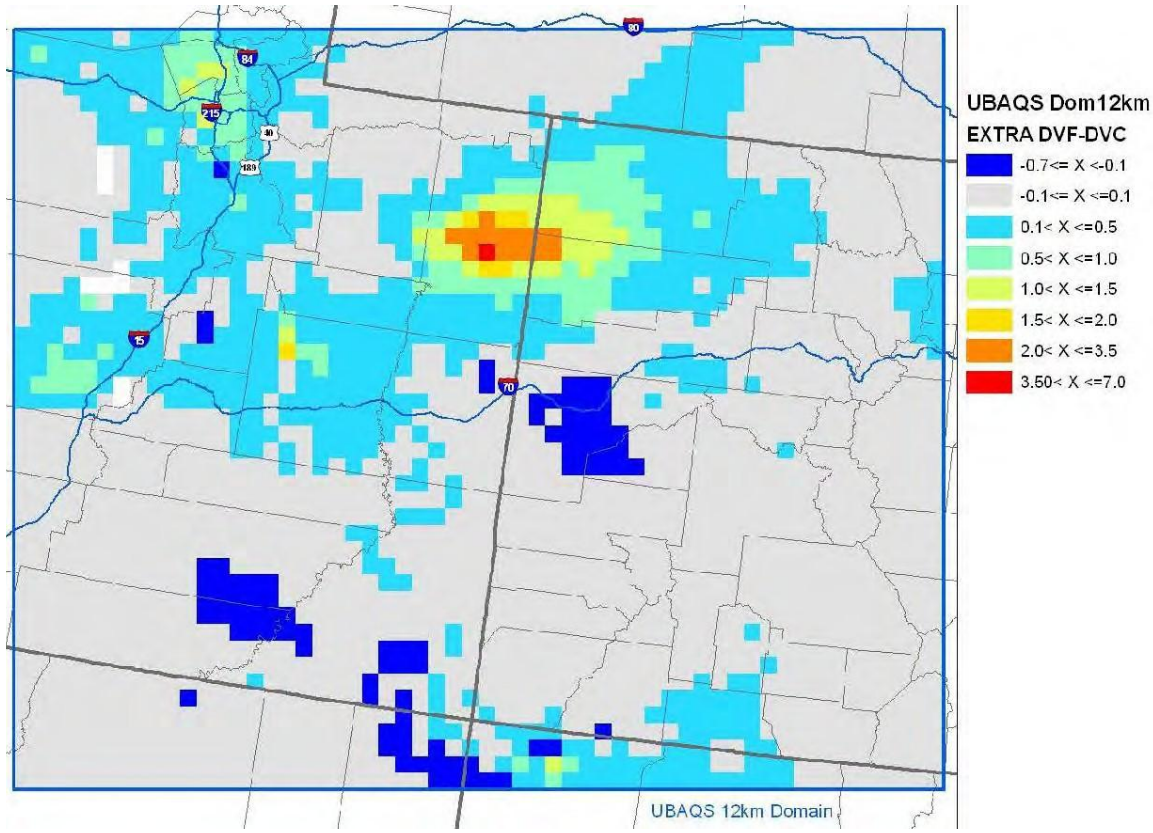
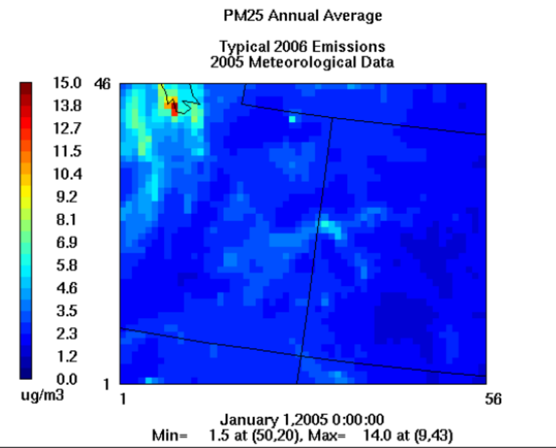
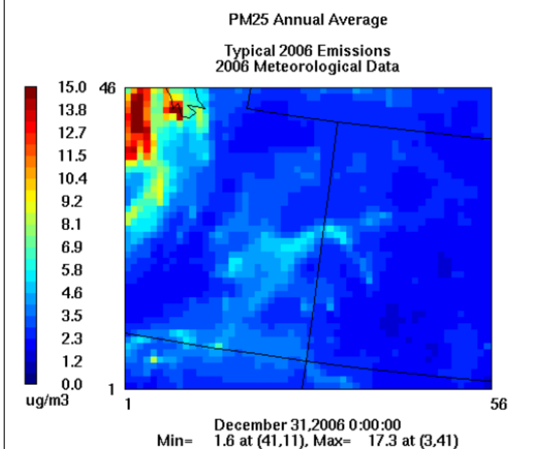


Figure 3.12-7 Differences in projected 2012 (DVF) and current year (DVC) 8-hour ozone Design Values

Secondary PM2.5

As with ozone, secondary $PM_{2.5}$ is not directly emitted into the atmosphere. Instead, secondary $PM_{2.5}$ is formed through the chemical combination of precursor pollutants that have been released into the ambient atmosphere. As a result, $PM_{2.5}$ must be assessed utilizing a regional photochemical modeling simulation. As with ozone, based on a review of the costs associated with completing such an analysis, the USFS was compelled to develop the secondary $PM_{2.5}$ analysis utilizing existing scientifically credible information. Reliance on the Uinta Basin Air Quality Study (UBAQS) for the ozone portion of this EIS that study was once again selected as the most representative and recently produced assessment of $PM_{2.5}$ for the Fishlake EIS region. Although the UBAQS contains shortcoming, it remains the most recently developed and technically defensible assessment of region-wide total (primary and secondary) $PM_{2.5}$ impacts for the FNF region.

The UBAQS produced an assessment of absolute modeled $PM_{2.5}$ concentrations. These values were generated for the entire 12km modeling domain and can be used for direct comparison to the NAAQS, which are 35 $\mu g/m_3$ for the 24-hour average and 15 $\mu g/m_3$ for the annual average. As with the ozone modeling, the absolute modeled $PM_{2.5}$ concentrations were calculated based upon "current" and "future" year emissions assessments. The current year emissions were based on assessments of emissions as they occurred during calendar year 2006 while the future year emissions where based on forecasted emissions growth for all sources to the year 2012. Each of these emissions scenarios were modeled utilizing two sets of meteorological conditions. Those observed in calendar year 2005 and those observed in calendar year 2006. These simulations were then used to calculate the absolute modeled PM_{25} impacts. Annual average and 24-hour average PM_{25} plots for both meterological years are shown below.

<table>
<tr><th>2005 Meteorological Year</th><th>2006 Meteorological Year</th></tr>
<tr><td>2006T</td><td>2006T</td></tr>
<tr><td>
</td><td>
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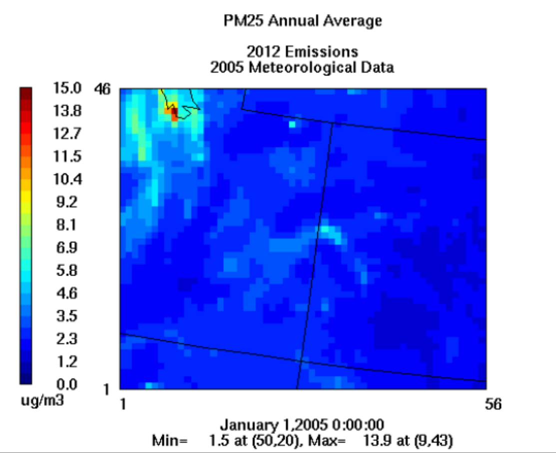
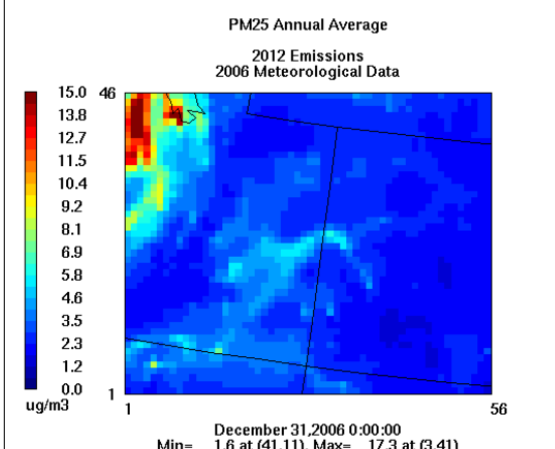
<tr><td>2012</td><td>2012</td></tr>
<tr><td>
</td><td>
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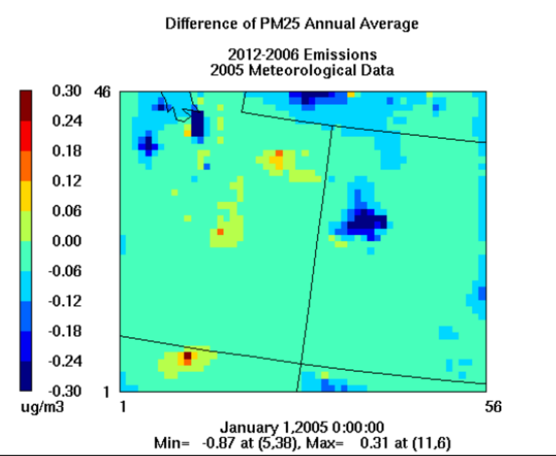
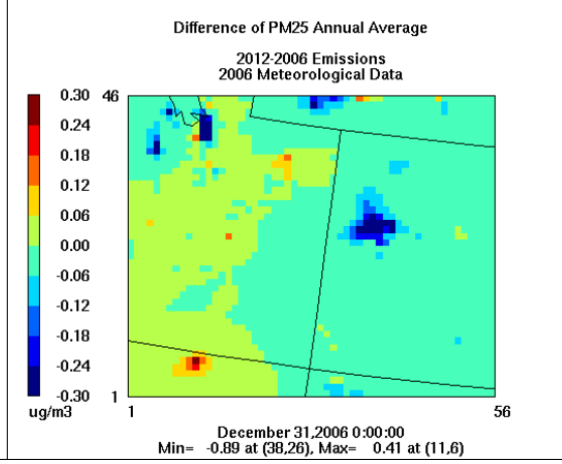
<tr><td>2012-2006</td><td>2012-2006</td></tr>
<tr><td>
</td><td>
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Figure 3.12-8 Modeled annual average $PM_{2.5}$ for comparison to NAAQS for 2005 and 2006

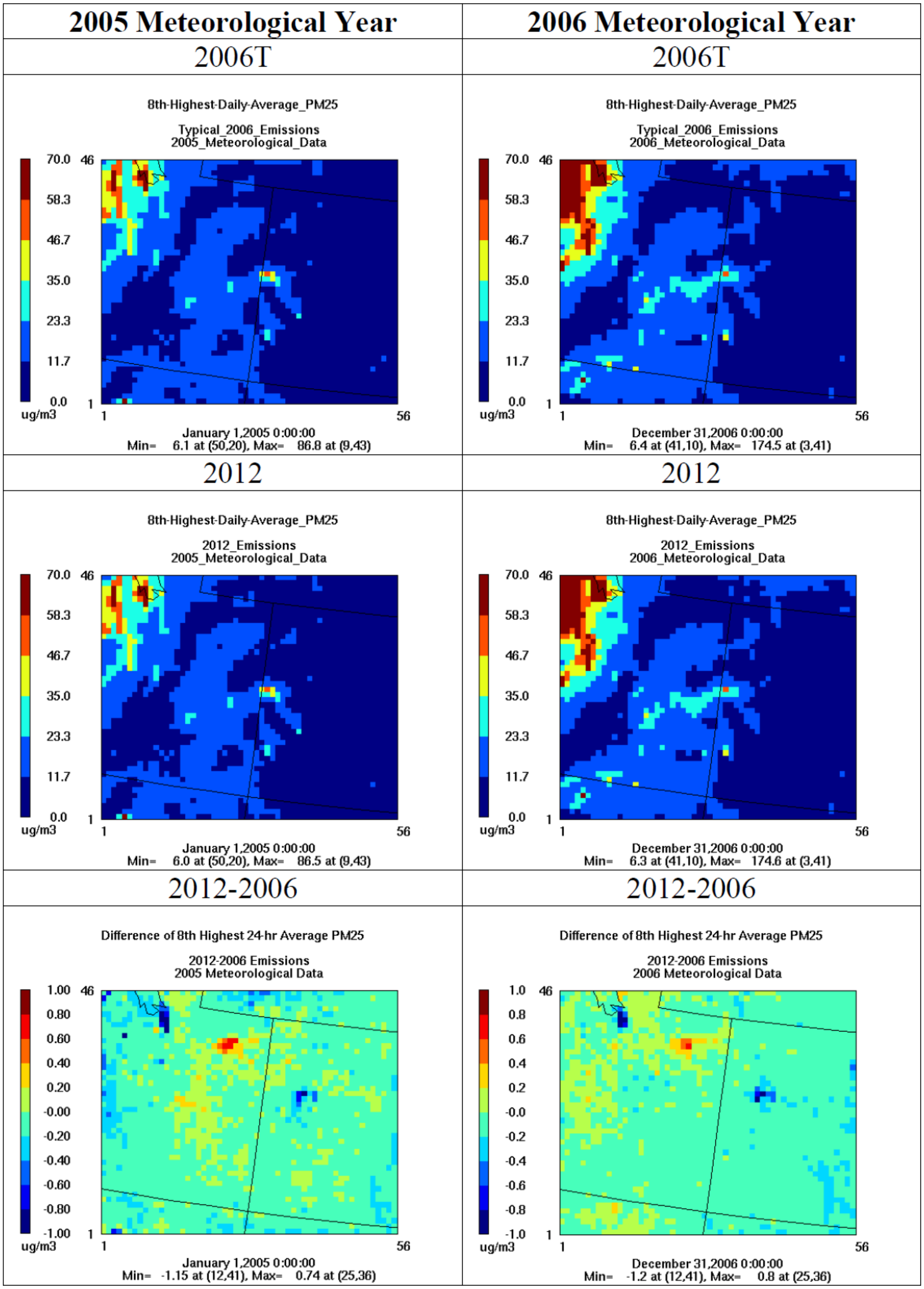

Figure 3.12-9 Modeled 24-hour average PM_{25} for comparison to NAAQS for 2005 and 2006

For the 2005 meteorological year, the current and future year emissions scenarios show $PM_{2.5}$ annual average values less than 15 µg/m_3 everywhere in the 12 km domain, including throughout the entire Fishlake EIS study region, indicating compliance with the NAAQS. In both the current and future year emissions scenarios, the maximum annual average $PM_{2.5}$ value within the 12 km domain is 14 µg/m_3 which occurs in the Salt Lake City region. Values within the Fishlake EIS study region are not predicted to exceed approximately 6 µg m_3.

For the 2006, meteorological year, the annual $PM_{2.5}$ is within the NAAQS everywhere within the 12 km domain except in the Salt Lake City area, where the maximum value is 17 µg/m_3 in both the current and future year emissions scenarios. In both the 2005 and 2006 meteorological years, there is a secondary $PM_{2.5}$ maximum extending from the center of the modeling domain southwest toward the Utah-Arizona border, but this region of elevated $PM_{2.5}$ does not exceed the annual average standard. The annual average $PM_{2.5}$, impacts are greater in the 2006 meteorological year than in 2005; however in no modeled scenario does absolute $PM_{2.5}$ impacts exceed 9 µg/m_3 in the Fishlake EIS study region. Figure 3.12-9 shows that the 98th percentile of the 24-hour $PM_{2.5}$ (8th highest 24-hour average) is less than the 35 µg/m3 standard over much the domain for both the current and future year emissions scenario, but exceeds 35 µg/m_3 in the Salt Lake City area and in the Uinta/Pinceance Basin in east-central Utah/west-central Colorado for both meteorological years. However, in both meteorological years, the Fishlake EIS study region is predicted to remain below the 35 µg/m_3 standard, and in most locations of the forest the impacts are predicted to be significantly below that value.

The pattern of changes in annual and 24-hour average $PM_{2.5}$ going from current to the future year emissions scenarios are similar in the 2005 and 2006 meteorological years. Maximum increases occur in northeastern Utah in the Uinta Basin and along the Arizona-Utah border and maximum decreases occur in western Colorado in the Piceance Basin, in Southwest Wyoming, and around Salt Lake City. In the Fishlake EIS study region, $PM_{2.5}$ impacts are projected to remain relatively constant and will not posed a threat to exiting $PM_{2.5}$ NAAQS on either an annual or 24-hour timescale.

Climate Change

Climatic conditions have, to some degree, already been affected by climate change and thus these past and current climate change effects are already included in the impact analysis of the EIS. Future climate change has the potential to further impact many of the same environmental resources in ways that are described in Appendix E.

It is difficult to predict with any certainty the cumulative effects of future climate change along with the environmental impacts already described in the EIS. The IPCC continental-scale modeling conducted for North America indicates warmer temperatures and generally less precipitation in the southwest U.S. on an annual basis (Christensen et al. 2007, p.850, p.887-888). For the western U.S., the IPCC modeling suggests modest changes in average annual precipitation ranging from slightly less than normal in the south to slightly greater than normal in the north. Change in winter precipitation is predicted to be variable with more winter precipitation in the northern part of the western U.S. and less in the Southwest. Summer precipitation is predicted to be less throughout the West. However, it is also noted that the continental-scale regions encompass a broad range of climates and are too large to be used as a basis for conveying quantitative regional climate change information. The IPCC projection of less warming over the ocean than the land, and amplification and northward displacement of the subtropical anticyclone is likely to cause a decrease in annual precipitation in the southwestern U.S. (Christensen et al. 2007). According to the Fourth Assessment Report of the IPCC (Christensen et al. 2007), the following general climate change projections were made for the southwest U.S.:

- Seasonally, warming is likely to be largest in summer.
- Maximum summer temperatures are likely to increase more than the average summer temperature.
- Annual mean precipitation is likely to decrease.
- Snow season length and snow depth are very likely to decrease.

Wagner et al. (2003) reviewed the work of a number of climatologists, evaluated 20th century climate records for trends, and conducted two large computer models with the assumption that CO_2 concentrations would double in the 21st century to predict climate change effects in the Great Basin/Rocky Mountain region. They noted that use of global-scale models cannot be expected to project climate changes at localized areas with highly variable climates and great topographic variation like the Great Basin/Rocky Mountain area. Their modeling results showed year-round increases in temperature with the greatest increases occurring in winter. They also showed that annual precipitation was predicted to increase with the greatest increase occurring in winter.

Most of Utah's water resources originate in mountainous areas above 6,500 feet in elevation, which cover about 19 percent of the state (BRAC 2007). The primary source of this water is snowpack, which releases months of stored precipitation in about 4 to 8 weeks during spring and summer, as described in Section 2.3.2 of Appendix E. Clear and robust long-term snowpack declines have yet to emerge in Utah’s mountains, as they have in low-elevation mountains in other states (i.e., in the Pacific Northwest and California). In addition, recent temperature increases in Utah appear to have had little impact on snowpack in the high mountains of the Intermountain West. However, studies of precipitation and runoff over the past several centuries and climate model projections for the next century indicate that ongoing GHG emissions at or above current levels will likely result in a decline in Utah’s mountain snowpack, thus the threat of severe and prolonged episodic drought in Utah is real (BRAC 2007). In addition, changes in snowpack will result in a declining water supply. Current climate models project a decline in summer precipitation across all of Utah (BRAC 2007).

The population of the Intermountain West (eight states including Utah) is projected to increase by 65 percent from 2000 to 2030, representing one-third of all U.S. population growth (USGCRP 2009). Between 2000 and 2005, Utah was among the five fastest growing states in the U.S. (US GCRP 2008). Projections of decreased snowpack and earlier spring melting suggest lower stream flows in the future, particularly during the high-demand period of summer (USGCRP 2008). There is a high likelihood that water shortages will limit power plant electricity production in many regions, and constraints in production by 2025 are projected in ten states including Utah (USGCRP 2009).

Forests are generally adapted to recent climatic conditions and variability (Hamrick 2004), but the rate of temperature change expected during the next century will greatly exceed that produced naturally over the past several thousand years. Apart from other human-related factors such as forest management practices and land-use changes, future climate change is likely to contribute to drier conditions in Utah forests as well as increased wildfire intensity, more insect outbreaks, and reduced forest health.

Droughts in Utah have exacerbated declining forest health across the state, and consequently Utah's forests have become more susceptible to intense wildfire, insects, and disease (UDNR 2003). The ecological impacts of wildfires as well as forest pests and diseases are expected to rise with climate warming, with extended periods of high fire risk and large increases in area burned (IPCC 2007b; USGCRP 2009). A study of historical spruce beetle outbreaks on the Markagunt Plateau revealed that small-scale disturbances have been the norm over the past century, and that large-scale outbreaks occurring in recent history (in the early 1990s, in this study) are an unprecedented phenomenon (DeRose and Long 2007).

The extent of sagebrush habitat is expected to decline in the future due to climate change, if current predictions are realized, due in large part to the expansion of cheatgrass (*Bromus tectorum*) under increased carbon dioxide conditions, which would fragment sagebrush habitat and lead to more frequent wildfires (FR 75(55):13910-14014, published 23 March 2010). A decline in sagebrush would indirectly affect wildlife, including special status species that depend on sagebrush, such as greater sage-grouse (Candidate) and pygmy rabbit (Sensitive).

3.13 SOCIAL/ECONOMIC

3.13.1 Affected Environment

This section addresses those aspects of the social and economic setting that are likely to be affected by leasing and subsequent exploration and development predicted in the RFDS as indicated in the issues statements.

The FNF covers parts of Beaver, Garfield, Iron, Juab, Millard, Piute, Sanpete, Sevier, and Wayne counties in central Utah. Rural communities, farms, ranches, and residences which could be affected are generally located in the valleys between the individual mountainous units of the FNF.

The people in the rural areas have a highly developed sense of place and connection to the land based on the settlement history, general lifestyle, water needs, and socio-economic dependency on the adjacent lands and resources. The FNF lands provide much of the primary scenery, resources, economic opportunities, and recreation opportunities needed to sustain the lifestyles and economies of the people living in the area, and to non-residents visiting the area for various reasons. Most non-residents are traveling through the area on the Interstate and State highways, taking advantage of recreation opportunities in the area, or are involved with development of resources (water, timber, minerals, recreation, etc.).

Agriculture continues to be a major industry today, but other non-agriculture economic segments have gained local importance. Families of the original settlers and other residents have close ties to their settlement history, the environment, and economic opportunities associated provided by NFS lands. The attitudes toward development of NFS lands, in contrast to non-commodity natural values are quite diverse within the adjacent communities.

The potential effects that oil and gas leasing and subsequent oil and gas exploration and development could have on the social and economic setting of the counties and communities in the vicinity of the FNF and on the local and state economies have been identified as issues for detailed analysis in this EIS. Changes to employment, housing, duration of oil and gas industry jobs and consistency with local and county planning goals were identified as evaluation criteria in making decisions regarding leasing. Just as important, were the financial returns to federal, state and local governments in the form of royalty payments and taxes.

3.13.2 Environmental Consequences

General Effects to Social and Economic Elements

The direct social and economic effects of oil and gas leasing on the FNF will be increased employment and earnings in the area surrounding the forest. The effects will actually occur in cities and towns surrounding the FNF, and not on the forest lands themselves. Spending by the oil companies and employee spending result in indirect and induced economic impacts in the area. Revenues from the shares of royalties and severance taxes also provide positive financial gains to the state and counties where the leasing occurs.

Energy development can bring with it economic prosperity in the form of increased employment, higher incomes, and an increased tax base. Development can also cause adverse effects if local communities cannot accommodate population increases associated with the development. The influx of workers and their families could cause changes in social structures and life styles and impose economic hardships if the need for public facilities and services arises before adequate local revenue sources are generated within the region.

Challenges that communities might face include a shortage in the supply of permanent and rental housing, inadequate infrastructure, overburdened medical facilities, schools and public services. The severity of impacts depends on site-specific factors such as local population size and growth rates, population densities in the affected communities and surrounding areas, proximity to regional population centers, availability of service, and retail businesses, and institutional capabilities to plan for, manage and finance necessary infrastructure facilities (U.S. General Accounting Office, 1982).

The prosperity and severity associated with energy development is also a function of project scale and duration. Large projects in close proximity to population centers will affect local communities more profoundly than self-contained, small-scale projects located far from local communities. Projects that encourage large-scale movement of people into an area for short time periods may also present serious challenges to local communities.

Under the various leasing options for development of the FNF oil and gas resources a variety of changes in the human environment of the study area could occur. Direct effects would include changes in employment and income that result from new jobs in the community for local residents during the exploration, development, and/or production phases. Indirect changes could take the form of increased business for local merchants and professionals (which would also increase the demand for labor), and possibly increase the population if development activities induce people to relocate permanently to the area.

Effects to Social and Economic Elements by Alternative

Alternative A

This is a no action/no lease alternative and maintains the status quo of direction on NFS lands in the four ranger districts. With this alternative, the RFDS would not come into play and no new oil and gas leasing would be allowed on the FNF. Existing leases would not be affected. However, when these leases expire, no new leases would be authorized. Alternative A would have no impact on local communities in the study area.

Alternative B

This alternative allows exploration in virtually all parts of the Forest. With Alternative B, all of the Forest would be open to leasing. Over 55 percent of the FNF would be available for leasing with LN, no road construction, and nearly 45 percent would be available for STL&C. All zones of High, Medium and Low development potential are represented for leasing and a full RFDS should be assumed. Table 3.13-1 below, illustrates the potential revenues from full implementation of the RFDS. In all counties, except Piute County, the creation of 11.3 jobs directly related to oil and gas exploration and development, and the 34.4 indirect jobs created, would be a relatively low impact on the local economies and housing and schools. If all the jobs created were all placed within Piute County, the impacts to the local economy and housing would be moderate given the smaller population of the county and the related community infrastructure.

Alternative C

This alternative allows exploration on a smaller portion of the Forest than Alternative B. With this alternative, 0.9 percent would be NL, 43 percent would be leasable with NSO, 13.6 percent would be available with a LN and TL, 16.9 percent would be available under a LN, 5.1 percent would be available under CSU and TL, 4.9 percent would be available under CSU, 9.8 percent would be available with SLT&C and TL, 5.7 percent would be available under SLT&C. See Alternative C Map for details on the distribution of these stipulations.

Under this alternative, nearly 99 percent of the FNF could be leased, but would be technologically unavailable with the high number of acres that are NSO. Drilling could directionally access NSO areas for a mile laterally from the well site, but no assumption is made as to how much of this would occur. Nearly all zones of High, Medium and Low development potential are represented for leasing and a full RFDS should be assumed. Table 3.13-1 below, illustrates the potential revenues from full implementation of the RFDS. In all counties, except Piute County, the creation of 11.3 jobs directly related to oil and gas exploration and development, and the 34.4 indirect jobs created, would be a relatively low impact on the local economies and housing and schools. If all the jobs created were all placed within Piute County, the impacts to the local economy and housing would be moderate given the smaller population of the county and the related community infrastructure.

Alternative D

This alternative makes available a much smaller portion of the FNF to exploration activities. With this alternative, 67.2 percent is unavailable under NL, 28.8 percent is available under NSO, 0.5 percent is available under LN, less than 2 acres available under CSU, and 3.5 percent is available under SLT&C. See Alternative D Map for details on the distribution of these stipulations.

Under this alternative over 2/3 of the FNF cannot be leased. This also decreases the possibility of reaching NSO acres by directional drilling. This alternative only makes a little more than 59,000 acres available with some form of occupancy in any of the High, Medium or Low potential zones. It is unlikely that full implementation of the RFDS could be achieved. For this analysis, at least one well field would not be developed and the resultant values being envisioned in the above figures would likely be halved. Using this scenario, only half of the expected jobs could be anticipated as in Alternatives B and C. In this same alternative, it is likely that only half of the community impacts could be expected as well, making the draw on the social infrastructure low in any of the counties in the impact area.

Table 3.13-1: Revenue potential from full implementation of the RFDS

Average Production (barrels)[7]		1,095,000
Price per Barrel[1]		$64
Value of Production		$70,080,000
Federal Royalties		
	Royalty Rate	0.125
	Total Royalty Paid	$8,760,000
	Amount Redistributed to Utah[2]	$4,390,000
	Amount Redistributed from Utah to Counties[3]	$1,752,000
Utah Severance Tax[4]		
	Rate on first $13/barrel	0.03
	Rate on value above $13/barrel	0.05
	Amount paid to Utah	$3,219,300
Property (Ad Valorem) Tax		
	Rate[5]	0.01
	Payments	$700,800
Conservation Fee[6]		
	Rate	0.002
	Payments	$140,160

1 Average of real (2008) Utah annual domestic crude oil first purchase price 92004-2008)
2 Half of federal royalty payment is returned to the State
3 40% of royalty payment returned to state is then returned to local governments or counties affected by wells via Utah Department of Transportation funds
4 Severance tax = 3% on the value of oil up to the first $13 per barrel. Rate increases to 5% of the value from $13.01 and above per barrel of oil. Severance taxes are paid to the state of Utah Uinta Basin and Navajo Revitalization Fund.
5 Rate based on average of assessed values and taxes charged, by county, in 2007 for affected counties
6 Conservation fee is two tenths of a percent of value of oil and gas produced and saved, sold, and transported from field where oil and gas is produced
7 Based on lower-bound estimate of 6,000 barrels per day for the Sevier Frontal Zone field and 30 wells in production (6000/30=200 barrels per day per well x 15 wells in operation on average x 365 days)

Cumulative Effects

Depending on the viability of the production field, oil and gas operations in the FNF could be long-term. The associated economic impacts then would also be long-term. Depending on the location of the production field, the magnitude of these impacts ranges from negligible to moderate. The cumulative effects of oil and gas development on the FNF in Alternatives B and C are estimated at 45 jobs and $1.8 million in annual wages for the nine-county area. Alternative D would be about half of the jobs and revenue.

3.14 SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

NEPA requires consideration of "the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity" (40 CFR

1502.16). As declared by the Congress, this includes using all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans (NEPA Section 101).

Alternative A

Since no oil and gas activity is planned, no minerals would be produced for human benefit. No new jobs or additional sources of revenue for federal, state and local purposes would be generated. Impacts to the housing market, educational facilities, hospitals or other social services would not occur if this alternative were selected. Dependence on foreign oil would remain the same.

Alternative B

This alternative has the greatest potential to provide financial returns to Federal, State and Local governments, as well as the greatest number of jobs, due to the largest land base made available for oil and gas exploration and production, as envisioned under the RFDS. It has the greatest potential to decrease the need for foreign oil dependence, keeping dollars earned in the United States.

This alternative has the greatest potential to affect the housing market, though minimal to moderate impacts are predicted in the socio-economic analysis. Other social services, such as education and medical care could be increased with the influx of workers, though the tax base through royalties, rentals and workers' income taxes could offset those concerns on balance or even a positive side.

Air quality would meet NAAQS and FLAG standards. Short-term construction and drilling would impact well sites for a matter of months. When downhole operations are completed, the well pad would be reduced for long term production. If the exploration well did not produce, pads and roads would be reclaimed to a productive vegetative state. Long-term productivity in terms of losses to soil, water, and wildlife would be incrementally small, even if the RFDS were played to the fullest extent. Once reclamation occurred, those losses would cease.

Scenery objectives could be compromised on a small scale during the life of the oil and gas operations, though BMP's should minimize those losses. Guidelines for scenery objectives would also provide protection of recreation areas, both developed and undeveloped areas. No long-term loss of recreation opportunity is expected, though short-term effects could be felt through increased traffic and noise during construction over a matter of months.

Climate change, through the development of oil and gas, would be infinitesimally small, even on a local scale. The refining and use of oil and gas products could contribute to greenhouse gases on a much broader scale, though it is unknown by this analysis, whether more or less GHG are produced by domestic production in Utah, vs. importing oil products from other parts of the world.

Alternative C

This alternative is similar in scope to Alternative B, though a higher number of acres are protected from actual well sites and roads. Economically, it is identical to B as well, as the RFDS has the same potential to be played out, though there may be increased costs of production to reach oil and gas with directional drilling. Long-term productivity would be nearly the same, but through NSO there would be greater contiguity of acres not impacted with roads and well sites.

Alternative D

This alternative places long-term productivity of the NF lands as its highest priority, giving the smallest returns to Federal, State and Local governments. Energy dependence on foreign oil is decreased the least under this scenario, with more dollars spent outside of the United States.

The likelihood of directional drilling is highest due to the amount of land actually available to site roads and well pads, thus increasing costs of production. There is a possibility that more road construction could occur under this alternative so that isolated tracts available for oil and gas activities could be reached.

The socio-economic report implied that half (or less) of the revenues would be realized under this alternative and would likely not meet the RFDS or the intent of FOOGLRA. Impacts to community services, housing and the local job market would be very minimal, as would economic growth from the oil and gas sector occur.

Air quality would meet NAAQS and FLAG standards. Short-term construction and drilling would impact well sites for a matter of months. When downhole operations are completed, the well pad would be reduced for long term production. If the exploration well did not produce, pads and roads would be reclaimed to a productive vegetative state. Long-term productivity in terms of losses to soil, water, and wildlife would be incrementally small, with the RFDS reduced to half or less. Once reclamation occurred, those losses would cease.

Recreational and scenery objectives would likely be met, though some short-term impacts could occur. Any potential impacts to wildlife and botanical communities are largely protected by NSO and NL.

Any potential climate change impacts from exploration and production would likely be halved or less, though it is unknown, by this analysis, whether more or less GHG would be generated on a global scale by importing oil products from other parts of the world.

3.15 UNAVOIDABLE ADVERSE EFFECTS

Unavoidable adverse effects are those effects of an alternative which can't be avoided through mitigation or project design after application of lease stipulations specified for the specific alternative being analyzed.

All of the action alternatives have the inherent distinction of a well pad and some length of road being built to access the site. Although this is unavoidable, numerous BMP's found in the Gold Book, the COA's made a part of the SUPO, and CFR's make this construction at the highest reasonable standard, minimizing effects and effectively screening it to the extent possible. The NF lands will be impacted with drilling operations spaced over a 15 year period, as envisioned in the RFDS. That can detract from the natural beauty of the forest, causing some temporary noise and traffic. However, to keep this in perspective, it still affects only about 0.08% of the entire forest. That acreage figure decreases even more if the well does not produce and the site is reclaimed.

Facilities will be onsite if oil and gas is discovered, such as well head pump jacks, a heater treater, tank batteries, a compressor and associated pipes. If well pumps are electrified, power lines to the wells will be needed, although they can be buried to reduce scenery impacts. Well pads used for production will be reduced in size by over half and fenced to keep wildlife and livestock from entering the site. Reclamation standards will enforce the use of grasses and forbs that are common and native to the area to bring productivity back to the site. Any new roads that are constructed will be gated to prevent public motorized traffic, thus keeping compliance with the Fishlake NF Motorized Travel Plan.

BLM, FS and State of Utah inspectors will be onsite before, during and after drilling to assure compliance of the BMP's. From a long-term perspective, oil wells have an anticipated life of approximately 30 years. Once production has ceased, the operator will be required to reclaim the site, and bonding will assure the job is done.

Alternative A
As no oil and gas facilities will be built, unavoidable adverse effects upon the land will not occur. However, no domestic production will occur on Fishlake NF lands, therefore no receipts to the Federal, state or local economies will accrue.

Alternative B
Since this alternative has the greatest amount of land available for oil and gas activities to be actually sited on NF surface, it has the greatest potential of drilling, road construction, pad development and construction. Although BMP's will be employed, if the full RFDS were developed and reclamation occurred, there would be approximately 350 acres with oil and gas facilities and about 20.6 miles of road that would be maintained by lessees for access to well sites. Approximately 565752 animal unit months (AUM) could possibly be eliminated due to reduced forage production (without mitigation.) Wildlife access to these acres would be restricted as well, due to fencing.

This alternative relies heavily on SLT&C to mitigate impacts, but also the COA's provided in the Fishlake NF Oil and Gas Operating Standards and Well Site Design requirements, the Gold Book, and the R4 Oil and Gas Road Guidelines would be enforced to protect not only wildlife and other natural resources, but recreation and scenery objectives.

Alternative C
This alternative is similar in scope to Alternative B; however, less land is available for oil and gas activities. It is still expected that the full RFDS could be played out under this alternative. Longer drilling times could be anticipated due to more land placed in NSO, and thus the potential for directional drilling cost is increased.

Alternative D
This alternative very likely would not provide the ability for the RFDS to be played out in full and is estimated to be half or even less in scope than Alternatives B or C. There is a very high proportion of the forest placed in No Lease status or NSO. Where lands could be leased and oil

and gas activities could actually be sited, the same unavoidable adverse effects would be the same, though on a smaller scale.

3.16 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Irretrievable commitments are those that are lost for a period of time, such as the temporary loss of timber productivity or range capacity for wildlife and livestock in areas that are cleared for a well pad and road. Irreversible commitments of resources are those that cannot be regained, such as the extinction of a species or the removal of oil and gas (once extracted can't be renewed within human concept of time.) The environmental effects discussions above describe irreversible losses of minerals such as oil and gas in all the action alternatives. Depletion of those resources would be as a result of mineral extraction through drilling and pumping.

Alternative A
Since there will be no leasing, no oil and gas activities will occur and therefore incur no irreversible or irretrievable commitments of resources.

Alternative B
Since this alternative gives greatest access for oil and gas development, it stands as having the greatest potential for irreversible commitment to the removal of oil and gas minerals beneath NF lands.

Irretrievable losses of resources such as soils, vegetation, water, wildlife and range production will occur over the life of leasing and oil and gas production, and until the roads and well sites are reclaimed.

Alternative C
Although this alternative is similar to Alternative B, fewer acres are actually available for leasing and siting of oil and gas activities. The potential exists that fewer minerals could be depleted because fewer acres are available, though this alternative still gives enough latitude for the RFDS to be realized. More fuel/energy/cost could be expended to find oil because more land is placed in NSO, thus increasing the need for directional drilling.

Irretrievable commitments to soils, wildlife and plant life are reduced in this alternative due to more habitat being protected, moving wildlife and botanical needs ahead of human needs for oil and gas production.

Alternative D
The commitments for this alternative are the same in Alternatives B and C, but on a much smaller scale. Wildlife, soils and plants are given the greatest consideration in lieu of human needs for oil and gas products.

3.17 OTHER REQUIRED DISCLOSURES

NEPA at 40 CFR 1502.25 (a) directs “To the fullest extent possible, agencies shall prepare environmental impact statements concurrently with and integrated with …other environmental review laws and executive orders.”

The Forest Service has consulted with several State and Federal agencies in preparation of this DEIS. The U.S. Department of Interior, Bureau of Land Management, and Fish and Wildlife Service and National Park Service have been contacted and participated in coordinating this proposed action. The Environmental Protection Agency has participated heavily in air quality issues, and will review this entire document. The State of Utah has participated through the Department of Parks and Recreation, Division of Wildlife Resources, Division of Water Quality, Division of Oil Gas and Mining, Division of Air Quality, and the Division of Environmental Quality.

Formal coordination will continue using established procedures of the various agencies. A Programmatic Agreement between the FNF and the Utah State Historical Preservation Office has been signed and will be implemented to assure that the National Historic Preservation Act is followed. Consultation with the Fish and Wildlife Service as required by the Endangered Species Act has been completed, and a Biological Opinion has been issued to the Forest Service, dated January 19, 2012.

This document, and accompanying project file, discloses numerous effects required by Federal laws and Executive Orders such as Executive Orders 13112 regarding invasive species, 13211 regulations about energy production, and 13212 regarding expediting energy projects, 13302 strengthening agency energy project completion, and 13423 strengthening federal energy conservation and reducing greenhouse gases, 11990, 11998, and Section 404 of the Clean Water Act. These laws require federal agencies to avoid the degradation of wetlands and floodplains.

The Migratory Bird Treaty Act and Bald and Golden Eagle Protection Act prohibits take of migratory birds and eagles. Application of the NSO stipulation in bald eagle winter concentration areas, and implementation of the terms contained in the migratory bird Lease Notice prior to surface disturbance, would greatly reduce, prevent the likelihood of take of eagles and migratory birds.

Any oil and gas development activities would have to comply with the Clean Air Act, the Utah air quality rules and regulations, as well as oil and gas specific US Environmental Protection Agency (EPA) regulations.

4.0 CONSULTATION AND COORDINATION

4.1 PREPARERS AND CONTRIBUTORS

The Forest Service consulted the following individuals, Federal, State, and local agencies, tribes and non-Forest Service persons during the development of this environmental assessment:

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5.2 Index

5.2 ACRONYMS

AQRV – Air Quality-Related Values
AO – Approval Order (permit-to-construct)
APD – Application for Permit to Drill
AQI – Air Quality Index
ATV – All-Terrain Vehicle
BA – Biological Assessment
BE – Biological Evaluation
Bext – Beta Extinction
BLM – Bureau of Land Management
BMP – Best Management Practice
BACT – Best Available Control Technology
BCT – Bonneville Cutthroat Trout
BO – Biological Opinion
BOE – Barrels of Oil Equivalent
CAA – 1970 Clean Air Act
CCFO – Cedar City Field Office
CEA – Cumulative Effects Area
CEQ – Council on Environmental Quality
CFR – Code of Federal Regulations
CMAQ – Community Multi-Scale Air Quality
CO – Carbon Monoxide
CO2 – Carbon Dioxide
CO2e – Carbon Dioxide equivalent
COA – Conditions of Approval
CP – Colorado Plateau
CRCT – Colorado River Cutthroat Trout
CSU – Controlled Surface Use
CWCS – Comprehensive Wildlife Conservation Strategy
CWS – Community Water System
DEIS – Draft Environmental Impact Statement
DBH – Diameter at Breast Height
DDW – Division of Drinking Water
DOI – Department of Interior (also USDI)
DVC – Design Values (Current)
DVF – Design Values (Future)
DWSPZ – Drinking Water Surface Protection Zone
EIS – Environmental Impact Statement
ENBB – Electronic Notification Bulletin Board
EPA – Environmental Protection Agency
ESA – Endangered Species Act
FEIS – Final Environmental Impact Statement
FLAG – Federal Land [Managers'] Air Guidance
FLM – Federal Land Managers
FSH – Forest Service Handbook
FSM – Forest Service Manual
FY – Fiscal Year
GHG – Greenhouse Gases
GIS – Geographic Information System
HFRA – Healthy Forests Restoration Act
HUC – Hydrologic Unit Code
IDT – Interdisciplinary Team
IM – Interagency Memorandum
IPAMS – Independent Petroleum Association of the Mountain States
IPCC – Intergovernmental Panel on Climate Change
IRA – Inventoried Roadless Area
LN – Lease Notice
LRMP – Land and Resource Management Plan (Forest Plan)
MATS – Modeled Attainment Test Software
MIS – Management Indicator Species
MOU – Memorandum of Understanding
MTP – Motorized Travel Plan
NA – Not Available for Leasing
NAAQS – National Ambient Air quality Standards
NEPA – National Environmental Policy Act
NESHAPS – National Emission Standards for Hazardous Air Pollutants
NHPA – National Historic Preservation Act
NL – No Lease
NOI – Notice of Intent (air permit application)
NOx – oxides of nitrogen
NP – National Parks
NPS – National Park Service
NTNCWS – Non-Transient Non-Community Water System
NSO – No Surface Occupancy
NSPS – New Source Performance Standards
NWR – National Wildlife Refuge
O&G – Oil and Gas
O3 – ozone
OHV – Off-Highway Vehicle
OMRD – Open Motorized Road Density
PAC – Protected Activity Center
Pb – Lead
PCIF – Permanent Community Impact Fund
PFA – Post Fledgling Area
PILT – Payments in Lieu of Taxes
PL – Public Law
PM – Particulate matter (airborne)
PM10 – Particulate matter less than 10 microns in diameter
PM2.5 – Particulate matter less than 2.5 microns in diameter
ppb – parts per billion
ppm – parts per million

PSD – Prevention of Significant Deterioration
PWS – Public Water System
RD – Ranger District
RFDS – Reasonable Foreseeable Development Scenario
RHR – Regional Haze Rule
RMP – Resource Management Plan
RNA – Research Natural Area
ROD – Record of Decision
ROS – Recreation Opportunity Spectrum
ROW – Right-of-Way
SIO – Scenic Integrity Objective
SIP – State Implementation Plan (Utah)
SIR – Supplemental Information Report
SITLA – State of Utah Institutional Trust Lands Administration
SLT&C – Standard Lease Terms and Conditions
SMP – Smoke Management Plan
SMS – Scenery Management System
SMU –Sustainable Multiple Use
SO2 – Sulfur Dioxide
SUPO – Surface Use Plan of Operations
T – Transient Zone
TDS – Total Dissolved Solids
TEC – Threatened, Endangered, or Candidate
TES – Threatened, Endangered, and Sensitive
TEPS – Threatened, Endangered, Proposed, and Sensitive
TL – Timing Limitation
Tpy – tons per year (air emissions)
TNCWS – Transient Non-Community Water System
UAA – Unmonitored Analysis Area
UBAQS – Uinta Basin Air Quality Study
UDAQ – Utah Division of Air Quality
UDEQ – Utah Department of Environmental Quality
UDOT – Utah Department of Transportation
UDWR – Utah Division of Wildlife Resources
µg/m3 – micrograms per meter cubed
UGS – Utah geological society
USDA – United States Department of Agriculture
USDI – United States Department of Interior (also DOI)
USFS – United States Forest Service
USFWS – United States Fish and Wildlife Service
USHPO – Utah State Historic Preservation Officer
UUA – Un-roaded/Undeveloped Area
VMS – Visual Management System
VOC – Volatile organic compounds
VQO – Visual Quality Objective
WA – Wilderness Areas
WRAP – Western Regional Air Partnership
WSA – Wilderness Study Area
WSR – Wild and Scenic River

6.0 APPENDICES

APPENDIX A – STIPULATIONS AND LEASE NOTICES

No Surface Occupancy Stipulation

APPLICABLE ALTERNATIVE(S)	STIPULATION
C	**No Surface Occupancy for Threatened, Endangered and Proposed Plants Locations and Sensitive Plants covered under a Conservation Agreement** **Where**: Areas within 1 mile of known federal Threatened, Endangered and Proposed (TEP) plant locations and within one mile of Sensitive plant locations covered under a Conservation Agreement. **For the purpose of:** Protecting and conserving threatened, endangered and proposed plant populations. **Exceptions:** An exception may be granted if through site specific study, and in cooperation with the US Fish and Wildlife Service, an area is determined to not be providing suitable habitat for any threatened, endangered or proposed plants. **Modification**: None
D	**No Surface Occupancy for Conservation Agreement and Recovery Plan Areas** **Where:** Within Forest Service delineated boundary of occupied habitat of threatened or endangered plants covered under a Conservation Agreement or Recovery Plan. **For the purpose of:** Protecting and conserving threatened, endangered and proposed plant populations. **Exceptions:** None **Modification:** None **Waiver:** None
D	**No Surface Occupancy for Sensitive Plant Habitat** **Where:** Within 1 mile of Forest Service delineated boundary of known sensitive plant species habitat. For the purpose of: Protecting and conserving sensitive habitat and plant populations. **Exceptions:** None **Modification:** None **Waiver**: None

Applicable Alternative(s)	Stipulation
C	**No Surface Occupancy for Riparian Areas** **Where:** Within 300 feet of Forest Service delineated boundary of riparian areas. **For the Purpose Of:** Protecting riparian ecosystems. Riparian ecosystems are managed to protect from conflicting uses in order to provide healthy, self-perpetuating plant and water communities that will have optimum diversity and density of understory and overstory vegetation. No well sites or production facilities will be allowed, and oil and gas exploration and development will be moved outside of the riparian vegetation area. Construction of roads, pipelines, and other similar facilities must comply with direction in the 1986 Fishlake and/or Dixie National Forest Land and Resource Management Plans. **Exceptions:** An exception could be authorized if: (a) an on-site review determines the area proposed to be impacted is not riparian; and (b) any additional mitigation that is determined to be necessary is fully implemented. **Modification:** None **Waiver:** None
D	**No Surface Occupancy for Perennial Streams, Wetlands, Springs, Lakes, Reservoirs and Riparian Areas** **Where:** Within 500 feet of Forest Service delineated boundary of perennial streams, wetlands, springs, lakes, reservoirs and riparian areas. **For the Purpose Of:** Protecting these ecosystems, and the quality of surface water resources. **Exceptions:** None **Modification:** None **Waiver:** None
C	**No Surface Occupancy for Delineated Wetlands** **Where**: Within 300 feet of delineated and mapped boundary of jurisdictional wetlands. **For the Purpose Of**: Protecting jurisdictional wetlands relative to Executive Order 11990, and the associated habitats, water quality, and ecosystems associated with these areas. In order to protect these areas no well sites or production facilities may be constructed in these areas, and oil and gas exploration and development will be moved out of wetlands. Construction of roads, pipelines, and other facilities must comply with direction in the 1986 Fishlake and/or Dixie National Forest Land and Resource Management Plans. **Exceptions:** An exception could be authorized if: (a) an on-site review determines the area proposed to be impacted is not a jurisdictional wetland, and (b) any additional mitigation determined to be necessary is fully implemented. **Modification:** None **Waiver**: None
C	**No Surface Occupancy for Perennial Streams, Reservoirs, Springs, and Lakes** **Where:** Within 300 feet of all perennial streams, reservoirs, springs and lakes. **For the Purpose Of:** Protection of water quality in surface water resources. **Exceptions:** None **Modification:** None **Waiver:** None

Applicable Alternative(s)	Stipulation
D	**No Surface Occupancy in Cold Water Fisheries** **Where:** Within 500 feet of all cold water fisheries **For the Purpose of:** Protecting the above wildlife habitats. **Exceptions:** None **Modification**: None **Waiver:** None
C	**No Surface Occupancy in Goshawk Core Nesting Areas** **Where:** Areas delineated by the Forest Service as core nesting areas for northern goshawk. Known goshawk nest areas are confidential and are not shown on any maps in the EIS. **For the purpose of:** Maintaining the integrity of nesting habitat structure and the character of the surrounding habitat within a territory. **Exception:** None **Modification**: None **Waiver:** The Authorized Officer may grant a waiver if conditions have changed such that there is no reasonable likelihood that the lease area can support further nesting activity. A waiver to the above lease stipulation may be requested along with the submission of a Surface Use Plan of Operations (36 CFR 228.104). Any Changes to this stipulation will be made in accordance with the appropriate Forest Plan and/or the regulatory provisions for such changes (For guidance on the use of this stipulation, see BLM Manual 1624 and 3101 or FS Manual 1950 and 2820).
C	**No Surface Occupancy on Steep Slopes** **Where:** Within areas delineated and mapped by the Forest Service having slopes greater than 35 percent, and high erosion potential areas in north horn sediments with slopes greater than 25 percent. **For the Purpose Of:** Protecting soil resources, because soils disturbed by construction and drilling activities on steep slopes would be difficult to reclaim. **Exception:** If, after an environmental analysis, the Forest Supervisor determines (1) there are no other practical placement alternatives, and (2) impacts could be fully mitigated, surface occupancy in the NSO area may be authorized. Additionally, a plan would be submitted by the operator and approved prior to construction and maintenance and include: An erosion control strategy, A detailed restoration/reclamation plan, and Proper survey and design (with construction plans and drawings) by a certified engineer. **Modification**: None **Waiver:** None
D	**No Surface Occupancy on Steep Slopes** **Where:** Within areas delineated and mapped by the Forest Service having slopes greater than 35 percent, and high erosion potential areas in north horn sediments with slopes greater than 25 percent. **For the Purpose Of:** Protecting soil resources, because soils disturbed by construction and drilling activities on steep slopes would be difficult to reclaim. No well sites or production facilities may be constructed in these areas. **Exceptions:** None **Modification:** None **Waiver:** None

Applicable Alternative(s)	Stipulation
C	**No Surface Occupancy for Geologic Hazards and Unstable Soils** **Where:** Within areas delineated and mapped by the Forest Service as containing geologic hazards and/or unstable soils. **For the Purpose Of:** Protecting soil resources, because soils disturbed by construction and drilling activities on steep slopes would be difficult to reclaim. No well sites or production facilities may be constructed in these areas. **Exceptions:** If after an environmental analysis the Forest Service authorized officer determines roads or other temp facilities may cross geologic hazards after a plan would be submitted by the operator and approved prior to construction and maintenance and include: ▪ An erosion control strategy ▪ A detailed slope stability analysis and plan for maintaining a stable slope ▪ A detailed restoration/reclamation plan ▪ Proper survey and design (with construction plans and drawings) by a certified engineer **Modification:** A modification may be granted if an on-the-ground inspection of a proposed well site or facility shows an area of less than 35% slope exists and mass wasting-prone soils do not exist or that design of the site can mitigate erosion, failure, and reclamation concerns. **Waiver:** None
D	**No Surface Occupancy for Geologic Hazards and Unstable Soils** **Where:** Within areas delineated and mapped by the Forest Service as containing geologic hazards and/or unstable soils. **For the Purpose Of:** Protecting soil resources, because soils disturbed by construction and drilling activities on steep slopes would be difficult to reclaim. No well sites or production facilities may be constructed in these areas. **Exceptions:** None **Modification**: None **Waiver**: None
C	**No Surface Occupancy for Developed Recreation Areas and National Recreation Trails** **Where:** Within ¼ mile of developed recreation sites and national recreation trails. **For the Purpose Of:** Protecting the capital investment and recreation uses associated with these sites. Construction of roads, pipelines, and other facilities must comply with direction in the appropriate Forest Plan. **Exception:** None **Modification:** A modification may be granted if a portion of the developed recreation sites in the leasehold are moved or eliminated. **Waiver:** A waiver may be granted if all the developed recreation site(s) in the leasehold are moved or eliminated.
D	**No Surface Occupancy for Developed Recreation Areas** **Where:** Within ¼ mile of developed recreation areas. **For the Purpose Of:** Protecting the capital investment and recreation uses associated with these sites. Construction of roads, pipelines, and other facilities must comply with direction in the appropriate Forest Plan. **Exceptions:** None **Modification:** None **Waiver:** None

APPLICABLE ALTERNATIVE(S)	STIPULATION
C	**No Surface Occupancy for Administrative Sites** **Where:** Within ¼ mile of Forest Service administrative sites. **For the Purpose Of:** Protecting the capital investment and uses associated with administrative sites. Construction of roads, pipelines, and other facilities must comply with direction in the appropriate Forest Plan. **Exception:** None **Modification:** A modification may be granted if a portion of the administrative site(s) in the leasehold are moved or eliminated. **Waiver:** A waiver may be granted if all the administrative site(s) in the leasehold are moved or eliminated.
D	**No Surface Occupancy for Administrative Sites and Special Use Facilities** **Where:** Within ¼ mile of Forest Service administrative sites and special use facilities. **For the Purpose Of:** Protecting the capital investment and uses associated with administrative sites. Construction of roads, pipelines, and other facilities must comply with direction in the appropriate Forest Plan. **Exceptions:** None **Modification:** None **Waiver:** None
C	**No Surface Occupancy in Inventoried Roadless Areas.** **Where:** Within the boundary of all Inventoried Roadless Areas. **For the Purpose Of:** Protecting the roadless and wilderness characteristics of these lands. No well sites or production facilities will be allowed on these lands. Construction of roads, pipelines, or other facilities must comply with direction in the appropriate Forest Plan. **Exception:** None **Modification:** None **Waiver**: None
C	**No Surface Occupancy in Research Natural Areas** **Where:** Within the boundary of all Research Natural Areas. **For the Purpose Of:** Protecting the characteristics, function, and intended use of these lands. **Exception:** None **Modification:** None **Waiver:** None
C	**No Surface Occupancy In Quitchupah Canyon Cultural Area** **Where:** Within the boundary of Quitchupah Canyon Cultural Area. **For the Purpose Of:** Protecting the cultural use and values of these lands. **Exception:** None **Modification:** None **Waiver:** None

Applicable Alternative(s)	Stipulation
C	**No Surface Occupancy in Old Spanish Trail Corridor** **Where:** Within the boundary of the Old Spanish Trail corridor delineated and mapped by the Forest Service. **For the Purpose Of:** Protecting the integrity of the trail and the viewshed along the corridor. **Exception:** None **Modification**: None **Waiver:** None
C	**No Surface Occupancy in Paradise Valley Cultural Resource Site** **Where:** Within the boundary containing a high density of recorded cultural resource sites in Paradise Valley, delineated and mapped by the Forest Service. **For the Purpose Of:** Protecting the cultural resources in this area containing an unusually high density of recorded sites. **Exception:** None **Modification:** None **Waiver:** None
C	**No Surface Occupancy for Areas with High Scenic Integrity** **Where:** Frequently viewed areas of high scenic integrity. **For the Purpose Of:** Preserving and maintaining High Scenery Integrity Objectives where there are primary important travel routes or use areas where users have a major concern for the aesthetics of the viewed landscape. **Exception:** An exception may be granted if the operator can demonstrate in the SUPO that the scenic integrity objectives can be met within one year. **Modification:** None **Waiver:** None
D	**No Surface Occupancy for Areas with High Scenic Integrity** **Where:** Within areas designated as High Scenic Integrity. **For the Purpose Of**: Preserving and maintaining High Scenery Integrity Objectives where there are primary important travel routes or use areas where users have a major concern for the aesthetics of the viewed landscape. **Exceptions:** None **Modifications:** None **Waivers:** None
C	**No Surface Occupancy for Drinking Water Source Protection Zones** **Where:** Within the delineated boundary of DWSPZs (Zones 1 – 3, and T2 and T4) **For the Purpose Of:** Protecting public drinking water sources in municipal and transient water protection zones. **Exception:** An exception may be granted for road construction if it is determined by site-specific analysis that: building the road in a water source protection zone has the least impact on the environment; roads already exist in the area; and the local municipality approves. **Modification:** None **Waiver:** None

APPLICABLE ALTERNATIVE(S)	STIPULATION
B, C	**No Surface Occupancy in Mexican Spotted Owl Protected Activity Centers** **Where:** Within delineated and mapped Mexican spotted owl PACs. **For the purpose of:** Protecting habitat areas for Mexican spotted owl that are not fully protected by the Endangered Species Act, which include all non-Critical Habitat areas. **Exceptions:** None **Modifications:** None **Waivers:** None
C	**No Surface Occupancy in Sage Grouse Leks** **Where:** Within 4 miles of sage grouse leks delineated and mapped by the Forest Service. **For the purpose of:** Protecting breeding and brood-rearing sage grouse from predation, habitat fragmentation, and disturbance. **Exceptions:** An exception may be granted if the Forest Supervisor, in coordination with the Utah Division of Wildlife Resources, determines through analysis that the nature of the actions, as proposed or conditioned, could be fully mitigated. This might occur if topography and/or vegetation are present that would effectively screen the structure or facility from the breeding habitat. **Modifications:** None **Waivers**: None
C	**No Surface Occupancy in Known Pygmy Rabbit Colonies** **Where:** Within pygmy rabbit colonies delineated and mapped by the Forest Service. **For the purpose of:** Protecting known populations of pygmy rabbits and their habitat. **Exceptions:** None **Modifications**: None **Waivers:** None
D	**No Surface Occupancy in Known Pygmy Rabbit Colonies and Potential Habitat** **Where:** Within pygmy rabbit colonies and potential habitat delineated and mapped by the Forest Service. **For the purpose of:** Protecting known populations of pygmy rabbits and their habitat. **Exceptions:** None **Modifications**: None **Waivers:** None
C	**No Surface Occupancy in Key Habitats for Boreal Toad** **Where:** Within key boreal toad habitat delineated and mapped by the Forest Service. **For the purpose of:** Protecting key habitat and known locations of boreal toad. **Exceptions:** None **Modifications:** None **Waivers:** None

Applicable Alternative(s)	Stipulation
D	**No Surface Occupancy in Goshawk Nesting, Nest Replacement and Post-Fledging Areas** **Where**: Within goshawk nesting, nest replacement and post-fledging areas delineated and mapped by the Forest Service. **For the purpose of:** Protecting goshawks and their habitat. **Exceptions:** None **Modifications:** None **Waivers:** None
D	**No Surface Occupancy in Critical Deer and Elk Range, and Calving and Fawning Areas** **Where:** Within critical deer and elk range, and calving and fawning areas delineated and mapped by Utah Division of Wildlife Resources (UDWR). **For the purpose of:** Protecting deer and elk and their critical habitat areas. **Exceptions:** None **Modifications**: None **Waivers:** None
C	**No Surface Occupancy in Bald Eagle Winter Concentration Areas** **Where:** Within bald eagle winter concentration areas delineated and mapped by the Forest Service. **For the purpose of:** Protecting bald eagles in their wintering habitat. **Exceptions:** An exemption may be granted if it is determined through site-specific analysis that the area is not suitable habitat. **Modifications**: None **Waivers:** None
D	**No Surface Occupancy in Bald Eagle Winter Concentration Areas** **Where:** Within bald eagle winter concentration areas delineated and mapped by the Forest Service. **For the purpose of:** Protecting bald eagles in their wintering habitat. **Exceptions:** None **Modifications:** None **Waivers:** None
D	**No Surface Occupancy in Areas with Primitive and Semi-primitive Non-motorized Recreation Opportunity Spectrum** **Where:** Within areas designated as Primitive and Semi-primitive Non-motorized ROS. **For the purpose of:** Protecting primitive and semi-primitive recreational values. **Exceptions:** None **Modifications:** None **Waivers:** None

Controlled Surface Use Stipulation

Applicable Alternative(s)	Stipulation
C	**Controlled Surface Use in Goshawk Post Fledging Areas** **Where:** Within goshawk PFAs delineated and mapped by the Forest Service. For the purpose of: Providing for goshawk fledgling survivorship by maintaining solitude and ambient noise levels during the fledgling period within the PFA. Surface occupancy or use is subject to the following special operating constraints: Prior to any surface disturbing activity in a goshawk PFA, a two-year protocol survey would be required and would need to be completed between March 1 and September 30. If any occupied or active nests are found within the PFA, high intensity oil and gas activities such as construction and drilling will be restricted in the area of the PFA from 1 March to 30 September or until birds have fledged as determined by Forest Service wildlife staff. **Exception:** None **Modification**: None **Waiver:** None
C	**Controlled Surface Use for Active Raptor Nests** **Where:** Within the influence zone of affected raptor species as determined by guidelines set forth by the US Fish and Wildlife Service. **For the purpose of:** Protecting nesting raptors and their young. Surface occupancy or use is subject to the following special operating constraints: Raptor nest surveys are required in potentially suitable habitats for all raptors, including Threatened, Endangered, Sensitive and MIS species prior to the approval of surface disturbing activities at a specific location. If active or occupied raptor nests are located, high intensity activities such as construction and drilling will be restricted surrounding the nest(s) within an influence zone. Influence zones and duration of restrictions would depend on the raptor species of concern as determined in the guidelines set forth by the US Fish and Wildlife Service for Utah species. Influence zones are line-of-sight to specified distances. If topography or vegetation provides adequate screening needed to maintain nest viability, the distance may be reduced (to be determined by the Fishlake National Forest wildlife biologist). **Exception:** None **Modification:** None **Waiver:** None

APPLICABLE ALTERNATIVE(S)	STIPULATION
B, C, D	**Controlled Surface Use for Class I Airsheds** **Where**: For exploratory projects on all lands within 5 km of Class I airsheds and for development and production projects on all lands in within 60 km of Class I airsheds. **For the purpose of:** Protection of air resources in and around Class I areas to meet or exceed FLAG guidelines. On all lands in within 60 km of Class I airsheds, surface occupancy or use is subject to the following special operating constraints: Proposed operations must be located and/or designed to not cause or contribute to adverse impacts to air quality related values in Class I airsheds. Operators will be expected to use appropriate Best Available Control Technology (BACT) to reduce impacts to air quality and air quality related values by reducing emissions from field production and operations. The future development of the lease parcels may be subject to appropriate mitigation and conditions of approval (COAs) to reduce or mitigate air resource impacts and GHG emissions. To ensure this, within 5 km for exploratory projects and within 60km for development and production projects of any Class I airshed an air impact analysis would be required prior to any field activity to demonstrate that proposed operations and associated mitigating measures will not result in an exceedances of the air standards as outlined in the most recent FLAG guidance. Typical design and mitigation measures may include: use of Tier IV or better engines, use of low sulfur fuels, electrification of well fields, flaring hydrocarbon and gases at high temperatures in order to reduce emissions of incomplete combustion; water dirt roads during periods of high use in order to reduce fugitive dust emissions; require that vapor recovery systems be maintained and functional in areas where petroleum liquids are stored; minimize roads and re-vegetate areas of the pad not required for production facilities to reduce the amount of dust from the pads. **Exception:** None **Modification:** None **Waiver:** None

Timing Limitation Stipulation

APPLICABLE ALTERNATIVE(S)	STIPULATION
C	**Timing Limitation for Bighorn Sheep Lambing Areas, Crucial Elk Calving and Mule Deer Fawning Habitat** **Where**: Within potential bighorn sheep lambing areas modeled and mapped by the Forest Service, and crucial elk calving and mule deer fawning habitat delineated and mapped by UDWR. No activities would be allowed during the critical time period May 1 to July 5. **For the Purpose Of:** Protecting lambing areas and crucial elk calving and mule deer fawning habitat by precluding activities which could cause increased stress and/or displacement. **Exception:** An exception may be granted if there are no practical alternatives, and the Forest Supervisor determines through analysis, and in coordination with the Utah Division of Wildlife Resources that the nature of the actions, as proposed or conditioned, could be fully mitigated. **Modification:** None **Waiver:** None

APPLICABLE ALTERNATIVE(S)	STIPULATION
C	**Timing Limitation for Crucial Elk and Mule Deer Winter Range** **Where**: Within crucial elk and mule deer winter range delineated and mapped by UDWR. No activities would be allowed during the critical time period December 1 to April 15. **For the Purpose Of:** Protecting crucial elk and mule deer winter range by precluding activities which could cause increased stress and/or displacement. **Exception:** An exception may be granted if there are no practical alternatives, and the Forest Supervisor determines through analysis and in coordination with the Utah Division of Wildlife Resources that the nature of the actions, as proposed or conditioned, could be fully mitigated. This might occur if seasonal conditions are such that the animals have moved and are not using the specified area during the time they would normally be expected. Factors to be considered would include elk presence or expected elk presence, snow depth, temperature, snow crusting, location of disturbance, forage quantity and quality, animal condition, and expected duration of disturbance. **Modification**: A modification may be granted if the Forest Supervisor determines through new habitat studies, coordinated with the Utah Division of Wildlife Resources, that a portion of the leasehold affected by this stipulation does not contain crucial elk winter range. **Waiver**: None
C	**Timing Limitation for Bighorn Sheep Winter Range** **Where:** Within potential bighorn sheep winter range modeled and mapped by the Forest Service. No activities would be allowed during the critical time period November 1 to April 15. **For the Purpose Of**: Protecting bighorn sheep winter range by precluding activities which could cause increased stress and/or displacement. **Exception:** An exception may be granted if there are no practical alternatives, and the Forest Supervisor determines through analysis and in coordination with the Utah Division of Wildlife Resources that the nature of the actions, as proposed or conditioned, could be fully mitigated. This might occur if seasonal conditions are such that the animals have moved and are not using the specified area during the time they would normally be expected. **Modification:** A modification may be granted if the Forest Supervisor determines through new habitat studies, coordinated with the Utah Division of Wildlife Resources, that a portion of the leasehold affected by this stipulation does not contain bighorn sheep winter range. **Waiver:** None
C	**Timing Limitation for Sage Grouse Brood-rearing Habitat** **Where:** Within sage grouse brood-rearing habitat delineated and mapped by UDWR. No activities would be allowed during the period May 1 through July 5. **For the Purpose Of:** Protecting sage grouse during the critical breeding season by precluding activities which could cause increased stress, displacement, and/or breeding failures. **Exception:** An exception may be granted if the Forest Supervisor, in coordination with the Utah Division of Wildlife Resources, determines through analysis that the nature of the actions, as proposed or conditioned, could be fully mitigated. **Modification:** A modification may be granted if the Forest Supervisor determines through coordination with the Utah Division of Wildlife Resources, that new habitat studies demonstrate a portion of the lease area affected by this stipulation no longer contains brood-rearing habitat. **Waiver**: A waiver may be granted if the Forest Supervisor determines through coordination with the Utah Division of Wildlife Resources, that new habitat studies demonstrate the entire lease area affected by this stipulation no longer contains brood-rearing habitat.

APPLICABLE ALTERNATIVE(S)	STIPULATION
C	**Timing Limitation for Sage Grouse (Structures in Winter Habitat)** **Where:** Within sage grouse winter habitat delineated and mapped by UDWR. **For the Purpose Of:** Protecting wintering sage grouse from predation, habitat fragmentation, and disturbance during the critical period from December 1 to March 15. **Exception:** An exception may be granted if the Forest Supervisor, in coordination with the Utah Division of Wildlife Resources, determines through analysis that the nature of the actions, as proposed or conditioned, could be fully mitigated. **Modification:** A modification may be granted if the Forest Supervisor determines through consultation with the U.S. Fish and Wildlife Service and coordination with the Utah Division of Wildlife Resources, that new habitat studies demonstrate a portion of the lease area affected by this stipulation no longer contains winter habitat. **Waiver:** A waiver may be granted if the Forest Supervisor determines through coordination with the Utah Division of Wildlife Resources, that new habitat studies demonstrate the entire lease area affected by this stipulation no longer contains winter habitat.

LEASE NOTICES

Since lease notices transmit information about laws, regulations, or orders, the language in these lease notices may change if the underlying law, regulation, or order changes.

APPLICABLE ALTERNATIVES	LEASE NOTICE
B, C, D	**Notice for National Forest System Lands Under the Jurisdiction of Department of Agriculture** In conducting operations associated with this lease, the lessee/operator must comply with all the rules and regulations of the Secretary of Agriculture set forth at Title 36, Chapter II, of the Code of Federal Regulations governing the use, occupancy, and management of National Forest System (NFS) lands when not inconsistent with existing lease rights granted by the Secretary of Interior. All matters related to this notice are to be addressed to the authorized representative of the Secretary of Agriculture: Forest Supervisor Fishlake National Forest 115 E. 900 N. Richfield, Utah 84701 Telephone: 435 896-9233 **CULTURAL RESOURCES (National Historic Preservation Act of 1966 (NHPA), P.L. 89-665 as amended by P.L. 94-422, P.L. 94-458, and P.L. 96-515):** The Forest Service authorized officer is responsible for ensuring that the leased lands are examined prior to the undertaking of any ground-disturbing activities to determine whether or not cultural resources are present, and to specify mitigation measures for effects on cultural resources that are found to be present. The lessee or operator shall contact the Forest Service to determine if a site-specific cultural resource inventory is required prior to undertaking any surface-disturbing activities on Forest Service lands covered by this lease. The lessee or operator may engage the services of a cultural resource specialist acceptable to the Forest Service to conduct any necessary cultural resource inventory of the area of proposed surface disturbance. In consultation with the Forest Service authorized officer, the lessee or operator may elect to conduct an inventory of a larger area to allow for alternative or additional areas of disturbance that may be needed to accommodate other resource needs or operations. The lessee or operator shall implement mitigation measures required by the Forest Service to preserve or avoid destruction of cultural resource values. Mitigation may include relocation of proposed facilities, testing, salvage, and recordation or other protective measures. During the course of actual surface operations on Forest Service lands associated with this lease, the lessee or operator shall immediately bring to the attention of the Forest Service the discovery of any cultural or paleontological resources. The lessee or operator shall leave such discoveries intact until directed to proceed by Forest Service. **THREATENED OR ENDANGERED SPECIES (The Endangered Species Act. (ESA), P.L. 93-205 (1973), P.L. 94-359 (1974), P.L. 95-212 (1977), P.L. 95-632 (1978), P.L. 96-159 (1979), P.L. 97-304 (1982), P.L. 100-653 (1988)).** The Forest Service authorized officer is responsible for compliance with the Endangered Species Act. This includes meeting ESA Section 7 consultation requirements with the

	U.S. Fish and Wildlife Service prior to any surface disturbing activities associated with this lease with potential effects to species and/or habitats protected by the ESA. The results of consultation may indicate a need for modification of or restrictions on proposed surface disturbing activities. The lessee or operator may choose to conduct the examination at their cost. Results of the examination will be used in any necessary ESA consultation procedures. This examination and any associated reports, including Biological Assessments, must be done by or under the supervision of a qualified resource specialist approved by the Forest Service. Any reports must also be formally approved by the USDA Forest Service biologist or responsible official.
B, C, D	**Lease Notice – Mexican Spotted Owl** The Lessee/Operator is given notice that the lands in this lease contain suitable habitat for Mexican spotted owl, a federally listed species. Insert the following if lease contains Designated Critical Habitat: [The Lessee/Operator is given notice that the lands in this lease contain Designated Critical Habitat for the Mexican spotted owl, a federally listed species. Critical habitat was designated for the Mexican spotted owl on August 31, 2004 (69 FR 53181-53298).] Avoidance or use restrictions may be placed on portions of the lease. Application of appropriate measures will depend on if the action is temporary or permanent, and whether it occurs within or outside the owl nesting season. A temporary action is completed prior to the following breeding season leaving no permanent structures and resulting in no permanent habitat loss. A permanent action continues for more than one breeding season and/or causes a loss of owl habitat or displaces owls through disturbances, i.e. creation of a permanent structure. The following avoidance and minimization measures have been designed to ensure activities carried out on the lease are in compliance with the Endangered Species Act. Integration of and adherence to these measures will facilitate review and analysis of any submitted permits under the authority of this lease. Following these measures could reduce the scope of ESA Section 7 consultation at the permit stage. Current avoidance and minimization measures include the following: 1) Surveys following Forest Service approved protocol will be required prior to operations unless species occupancy and distribution information is complete and available. All surveys must be conducted by qualified individual(s). 2) Assess habitat suitability for both nesting and foraging using accepted habitat models in conjunction with field reviews. Apply the conservation measures below if project activities occur within 0.5 mile of suitable owl habitat. Determine potential effects of actions to owls and their habitat. 3) Document type of activity, acreage and location of direct habitat impacts, type and extent of indirect impacts relative to location of suitable owl habitat. Document if action is temporary or permanent. 4) Lease activities will require monitoring throughout the duration of the project. To ensure desired results are being achieved, minimization measures will be evaluated and, if necessary, Section 7 consultation reinitiated. 5) Produced water will be managed to ensure maintenance or enhancement of riparian habitat. 6) Where technically and economically feasible, use directional drilling or multiple wells from the same pad to reduce surface disturbance and eliminate drilling in canyon habitat suitable for Mexican spotted owl nesting. For all temporary actions that may impact owls or suitable habitat: 1) If the action occurs entirely outside of the owl breeding season (March 1-August 31), and leaves no permanent structure or permanent habitat disturbance, action can proceed without an occupancy survey. 2) If action will occur during a breeding season, survey for owls prior to commencing activity. If owls are found, consultation with USFWS must be reinitiated and activity must be delayed until consultation is completed.

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3) Rehabilitate access routes created by the project through such means as raking out scars, revegetation, gating access points, etc.

For all permanent actions that may impact owls or suitable habitat:

1) Survey two consecutive years for owls according to accepted protocol prior to commencing activities.
2) If owls are found, no actions will occur within 0.5 mile of identified nest site. If nest site is unknown, no activity will occur within the designated Protected Activity Center (PAC).
3) Avoid drilling and permanent structures within 0.5 mi of suitable habitat unless surveyed and not occupied.
4) Reduce noise emissions (e.g., use hospital-grade mufflers) to 45 dBA at 0.5 mile from suitable habitat, including canyon rims. Placement of permanent noise- generating facilities should be determined by a noise analysis to ensure noise does not encroach upon a 0.5 mile buffer for suitable habitat, including canyon rims.
5) Limit disturbances to and within suitable habitat by staying on approved routes.
6) Limit new access routes created by the project.

Additional measures to avoid or minimize effects to the species may be developed and implemented in consultation with the U.S. Fish and Wildlife Service between the lease sale stage and lease development stage to ensure continued compliance with the Endangered Species Act.

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Lease Notice – California Condor

The Lessee/Operator is given notice that the lands located in this parcel contain potential habitat for the California condor, a federally listed species. Avoidance or use restrictions may be placed on portions of the lease if the area is known or suspected to be used by condors. Application of appropriate measures will depend on whether the action is temporary or permanent, and whether it occurs within or outside potential habitat. A temporary action is completed prior to the following important season of use, leaving no permanent structures and resulting in no permanent habitat loss. This would include consideration for habitat functionality. A permanent action continues for more than one season of habitat use, and/or causes a loss of condor habitat function or displaces condors through continued disturbance (i.e. creation of a permanent structure requiring repetitious maintenance, or emits disruptive levels of noise).

The following avoidance and minimization measures have been designed to ensure activities carried out on the lease are in compliance with the Endangered Species Act. Integration of and adherence to these measures will facilitate review and analysis of any submitted permits under the authority of this lease. Following these measures could reduce the scope of Endangered Species Act, Section 7 consultation at the permit stage.

Current avoidance and minimization measures include the following:

1) Surveys will be required prior to operations unless species occupancy and distribution information is complete and available. All Surveys must be conducted by qualified individual(s) approved by the Forest Service, and must be conducted according to approved protocol.
2) If surveys result in positive identification of condor use, all lease activities will require monitoring throughout the duration of the project to ensure desired results of applied mitigation and protection. Minimization measures will be evaluated during development and, if necessary, Section 7 consultation may be reinitiated.
3) Temporary activities within 1.0 mile of nest sites will not occur during the breeding season.
4) Temporary activities within 0.5 miles of established roosting sites or areas will not occur during the season of use, August 1 to November 31, unless the area has been surveyed according to protocol and determined to be unoccupied.
5) No permanent infrastructure will be placed within 1.0 mile of nest sites.
6) No permanent infrastructure will be placed within 0.5 miles of established

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	roosting sites or areas. 7) Lessee is responsible to remove big game carrion (which may be an unwanted attractant) to 100 feet from on lease roadways occurring within foraging range as feasible in coordination with the UDWR and the Forest Service. 8) Where technically and economically feasible, use directional drilling or multiple wells from the same pad to reduce surface disturbance and eliminate drilling in suitable habitat. Additional measures may also be employed to avoid or minimize effects to the species between the lease sale and lease development stages. These additional measures will be developed and implemented in consultation with the U.S. Fish and Wildlife Service to ensure continued compliance with the Endangered Species Act.
B, C, D	**Lease Notice – Western Yellow-billed Cuckoo** The Lessee/Operator is given notice that the lands located in this parcel contain potential habitat for the Western yellow-billed cuckoo, a federally listed species. In areas that contain riparian habitat within the range of the species, actions that may cause stress and disturbance during nesting and rearing of young would be avoided or restricted. Appropriate measures will depend on if the action is temporary or permanent, and whether it occurs within or outside the nesting season. A temporary action is completed prior to the breeding season leaving no permanent structures and resulting in no permanent habitat loss. A permanent action continues for more than one breeding season and/or causes a loss of habitat or displaces individuals through disturbances. Current avoidance and minimization measures include the following: 1) Surveys would be required prior to operations unless species occupancy and distribution information is complete and available. All surveys must be conducted by qualified individual(s) and be conducted according to protocol. 2) Activities would require monitoring throughout the duration of the project. To ensure desired results are being achieved, minimization measures would be evaluated and, if necessary, Section 7 consultation reinitiated. 3) Water production would be managed to ensure maintenance or enhancement of riparian habitat. 4) Where technically and economically feasible, use directional drilling or multiple wells from the same pad to reduce surface disturbance and eliminate drilling in suitable riparian habitat. Ensure that such directional drilling does not intercept or degrade alluvial aquifers. 5) Activities would maintain a 300 feet buffer from suitable riparian habitat year long. 6) Activities within ¼ mile of occupied breeding habitat would not occur during the breeding season of May 1 to August 15. 7) Ensure that water extraction or disposal practices do not result in change of hydrologic regime that would result in loss or degradation of riparian habitat. 8) Re-vegetate with native species all areas of surface disturbance within riparian areas and/or adjacent land. 9) Additional measures to avoid or minimize effects to the species may be developed and implemented in consultation with the USFWS between the lease sale stage and lease development stage to ensure continued compliance with the ESA.
B, C, D	**Lease Notice – Migratory Birds** The lessee/operator is given notice that surveys for nesting migratory birds may be required during migratory bird breeding season whenever surface disturbances and/or

	occupancy is proposed in association with fluid mineral exploration and development within priority habitats. Surveys should focus on identified priority bird species in Utah. Field surveys will be conducted as determined by the authorized officer of the USDA Forest Service. Based on the result of the field survey, the authorized officer will determine appropriate buffers and timing limitations. This notice may be waived, excepted, or modified by the authorized officer if either the resource values change or the lessee/operator demonstrates that adverse impacts can be mitigated.
B, C, D	**Lease Notice- Sensitive and MIS Species (Plants and Wildlife)** The Lessee/Operator is given notice that the lands in this parcel contain suitable habitat for sensitive, and/or management indicator species. The following avoidance and minimization measures have been developed to facilitate locating and designing operations to avoid adverse effects to the viability of these species. Prior to conducting any surface disturbing activities within suitable habitat for sensitive and Management Indicator Species (MIS), surveys would need to be completed. If sensitive or MIS are found, ground disturbing activities may be moved up to ½ mile to buffer around occupied habitat that is essential to the persistence of the species on the Fishlake National Forest.
B, C, D	**Lease Notice- Utah Prairie Dog** The lessee/operator is given notice that lands in this lease may contain historic and/or occupied Utah prairie dog habitat, a threatened species under the Endangered Species Act. Avoidance or use restrictions may be placed on portions of the lease. Application of appropriate measures will depend whether the action is temporary or permanent, and whether it occurs when prairie dogs are active or hibernating. A temporary action is completed prior to the following active season leaving no permanent structures and resulting in no permanent habitat loss. A permanent action continues for more than one activity/hibernation season and/or causes a loss of Utah prairie dog habitat or displaces prairie dogs through disturbances, i.e. creation of a permanent structure. The following avoidance and minimization measures have been designed to ensure activities carried out on the lease are in compliance with the Endangered Species Act. Integration of, and adherence to these measures will facilitate review and analysis of any submitted permits under the authority of this lease. Following these measures could reduce the scope of Endangered Species Act, Section 7 consultation at the permit stage. Current avoidance and minimization measures include the following: 1) Surveys will be required prior to operations unless species occupancy and distribution information is complete and available. All Surveys must be conducted by qualified individual(s) approved by the Forest Service (i.e., needs to have passed the USFWS Utah Prairie Dog survey course). 2) Lease activities will require monitoring throughout the duration of the project. To endure desired results are being achieved, minimization measures will be evaluated and, if necessary, Section 7 consultation reinitiated. 3) Where technically and economically feasible, use directional drilling or multiple wells from the same pad to reduce surface disturbance and eliminate drilling in prairie dog habitat. 4) Surface occupancy or other surface disturbing activity will be avoided within 0.5 mile of active prairie dog colonies. 5) Permanent surface disturbance or facilities will be avoided within 0.5 mile of potentially suitable, unoccupied prairie dog habitat, identified and mapped by Utah Division of Wildlife Resources. 6) The lessee/operator should consider if fencing infrastructure on well pad, e.g., drill pads, tank batteries, and compressors, would be needed to protect equipment from burrowing activities. In addition, the operator should consider if future surface disturbing activities would be required at the site. 7) Within occupied habitat, set a 25 mph speed limit on operator-created and access roads and adhere to speed limit on maintained roads. The speed limit may have to be revisited on a site-specific basis and reduced. 8) Limit disturbances to and within suitable habitat by staying on designated

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9) Limit new access routes created by the project.
10) Unavoidable impacts to the species will be mitigated through site-specific consultation with the US Fish and Wildlife Service.

Additional measures to avoid or minimize effects to the species may be developed and implemented in consultation with the U.S. Fish and Wildlife Service between the lease sale stage and lease development stage to ensure continued compliance with the Endangered Species Act.</td></tr>
<tr><td>B,C,D</td><td>Lease Notice for Air Resources

(Clean Air Act of 1963, as amended by P.L. 90-148, P.L. 91-604, and P.L. 101-549; National and State of Utah Ambient Air Quality Standards, National Standards of Performance for New Stationary Sources, National Prevention of Significant Deterioration Standards, National Emissions Standards for Hazardous Air Pollutants, Utah Air Conservation Regulations (R446), and Utah State Implementation Plan)

1. The operator shall comply with the following practices to control impacts to ambient air quality from oil and gas exploration and production activities:

a. As appropriate, quantitative analysis of potential air quality impacts will be conducted for project-specific developments by the operator, in concert with direction from the Utah Department of Environmental Quality, Division of Air Quality (UDAQ), the Forest Service and cooperating federal land management agencies including but not limited to the National Park Service. The Forest Service will notify cooperating agencies as project specific proposals are received and additional air impact analyses are performed to ensure input from those agencies. Additional project specific air impact analyses would need to be conducted if the following project criteria are fulfilled:

i. If an exploration drilling project is proposed within 5km of an adjacent Class I area, air quality related value (AQRV) impacts would need to be addressed utilizing at a minimum the VISCREEN screening tool. Additional air impact analyses may be necessary based on the review of the initial VISCREEN analysis.
ii. If an oil and gas production project is proposed at a distance of over 60km from an adjacent Class I area and has emissions that exceed those utilized in the existing “Fishlake 12-well development scenario", A quantitative air quality impact analysis would need to be conducted for the project that follows the guidance found in the FLAG modeling guidelines.
iii. If an oil and gas production project is proposed within 60km of an adjacent Class
I area and has emissions that equal or exceed those utilized in the existing “Fishlake 12-well development scenario", a quantitative air quality impact analysis would need to be conducted for the project that follows the guidance found in the FLAG modeling guidelines.
iv. If an exploratory drilling or oil and gas development project is proposed to occur within 60km of an adjacent Class I area and has emissions that are greater than those utilized in the existing "exploratory drilling scenario" but less than those utilized in the "Dixie 20-well development scenario", consultation with the Forest
Service and cooperating Federal Agencies would be required to determine an appropriate assessment of air quality impacts. The level of additional analysis would be predicated on the size of the proposed project.
b. Compliance with Utah Air Conservation (UAC) Regulation R446-1 would be necessary. The best air quality control technology, as per guidance from the UDAQ, will be applied to actions as needed to meet air quality standards.
c. The operator will comply with UAC Regulation R446-1-4.5.3, which prohibits the
use, maintenance, or construction of roadways without taking appropriate dust abatement measures. Compliance will be obtained through special stipulations as a requirement on new projects and through the use of dust abatement control techniques in problem areas.</td></tr>
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	d. The operator will manage authorized activities to maintain air quality within the thresholds established by the State of Utah Ambient Air Quality Standards and to ensure that those activities continue to keep the area in attainment, meet prevention of significant deterioration (PSD) Class II standards, and protect the Class I air shed of the National Parks (e.g. Zion, Bryce Canyon, and Capitol Reef National Parks). e. National Ambient Air Quality Standards will be enforced by the UDEQ, with EPA oversight. Special requirements to reduce potential air quality impacts will be considered on a case-by-case basis in processing land-use authorizations. f. The operator will utilize BMPs and site specific mitigation measures, when appropriate, based on-site specific conditions, to reduce emissions and enhance air quality. Examples of these types of measures can be found in the Four Corners Air Quality Task Force Report of Mitigation Options, November 1, 2007; EPA Natural Gas STAR Program (http://www.epa.gov/gasstar/); and US Forest Service Emission Reduction Techniques for Oil and Gas activities 2011 (http://www.fs.fed.us/air/documents/EmissionReduction- 010711x.pdf). g. The operator will comply with a Condition of Approval for Applications for Permit to drill, which includes: (1) All new and replacement internal combustion diesel fired drilling engines must meet or exceed Tier II emissions limits as codified in 40 CFR Part 89 - "Control of Emissions From New and In-Use Nonroad Compression-Ignition Engines". h. Lease holders will need to conduct detailed volatile organic compound (VOC) emissions inventories for any proposed facilities to provide necessary data to the BLM Utah State Office for their regional photochemical modeling. i. Lease holders will need to examine the use of additional mitigations for ozone precursors. 2. All new and replacement internal combustion diesel fired well pump engines must meet or exceed Tier II emissions limits for Particulate Matter and Tier III emissions limits for Oxides of Nitrogen and Carbon Monoxide as codified in 40 CFR Part 89 - "Control of Emissions From New and In-Use Nonroad Compression-Ignition Engines". 3. All new and replacement spark ignited natural gas fired internal combustion well-pump engines must meet or exceed emissions limits for Oxides of Nitrogen, Carbon Monoxide and Volatile Organic Compounds from New Source Performance Standard Subpart JJJJ for Stationary Spark Ignition Internal Combustion Engines manufactured since 2008. 4. All new and replacement internal combustion gas field engines of less than or equal to 300 design-rated horsepower must not emit more than 2 grams of NOx per horsepower-hour. This requirement does not apply to gas field engines of less than or equal to 40 designated horsepower. 5. All new and replacement internal combustion gas field engines of greater than 300 design rated horsepower must not emit more than 1.0 grams of NOx per horsepower-hour. 6. All diesel fuel fired internal combustion engines must utilize certified Ultra Low Sulfur Diesel fuel with a maximum sulfur content of 15 parts per million (PPM).

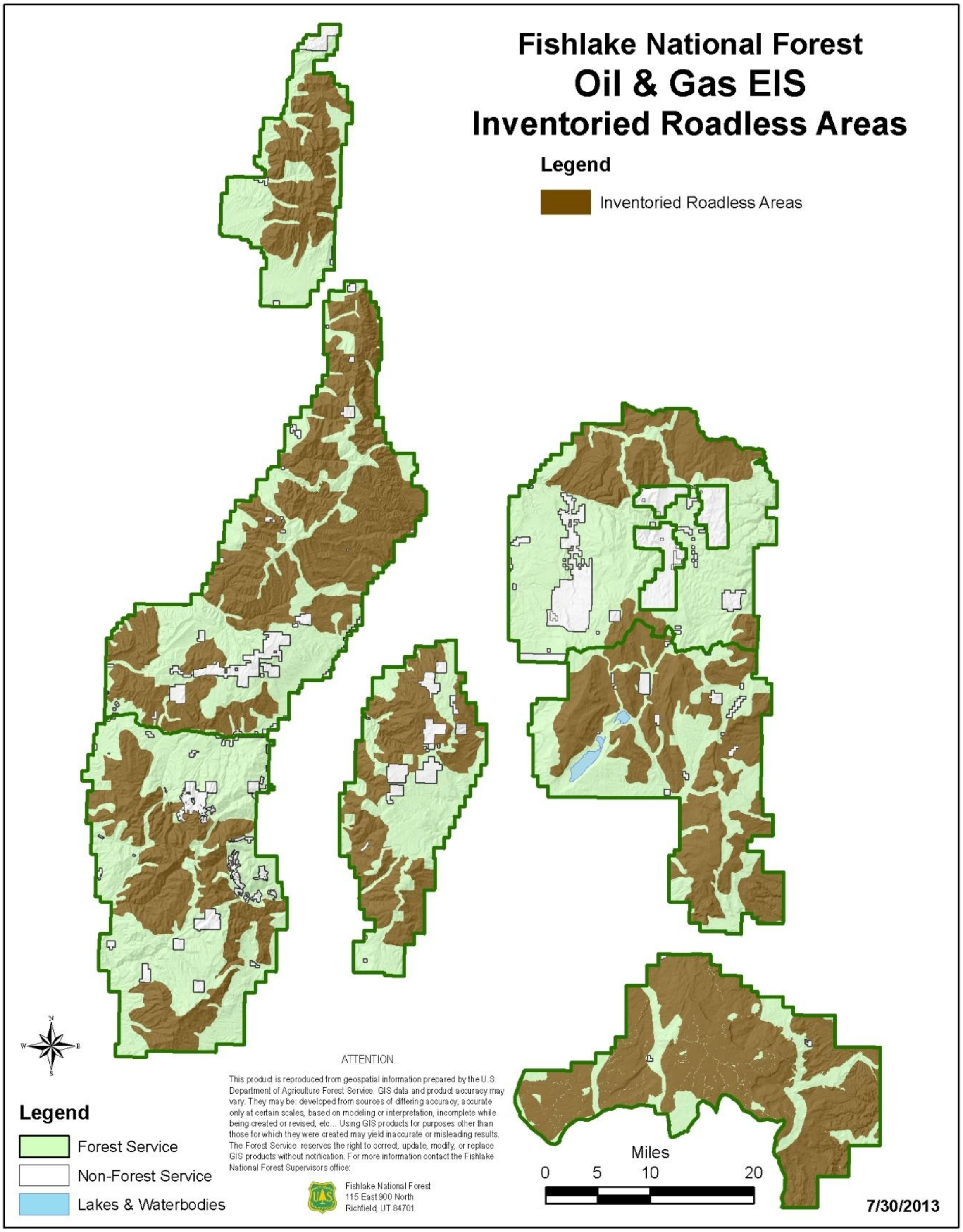
B, C, D	**Lease Notice - Drinking Water Source Protection Zone Condition of Approval (COA)** The following is required language for approval for Oil and Gas activities with source water protections zones: This lease (or a portion thereof) has been determined to be within a public Drinking Water Source Protection Zone. Prior to any surface-disturbing activity, the lessee/operator must contact the BLM field office and the public water system manager to determine any zoning ordinances, best management or pollution prevention measures, or physical controls that may be required within the protection zone(s). Compliance with Drinking Water Source Protection plans, developed by public water systems under the requirements of R309-600, Drinking Water Source Protection for Ground-Water Sources (Utah Administrative Code), is mandatory. Compliance with county ordinances to protect the source protection zones, as required by Section 19-4-113 of the Utah Code, is also mandatory. Some public water sources qualify for monitoring waivers which reduce their monitoring requirements for pesticides and volatile organic chemicals (VOCs). Exploration, drilling, and production activities within Source Protection zones could jeopardize these waivers, thus requiring increased monitoring. The operator must contact the public water system administrator to determine what effect their activities may have on the public water system's monitoring waivers. Compliance with other Utah State rules to protect surface and ground water such as the Utah Division of Water Quality Rule R317 (Water Quality Rules) and Rule R649 (Rules of the Utah Division of Oil, Gas and Mining, Utah Oil and Gas Conservation) is required. <u>Groundwater Protection Zones 1-4:</u> This lease (or a portion thereof) is within one or more Drinking Water Source Protection Zones (DWSPZs) designated by the Utah Division of Drinking Water (DDW). Prior to a lease being offered up for sale that overlies a DWSPZ the BLM would attach IM No. UT 2010-055, Attachment F (Utah Drinking Water Source Protection Zone Lease Notice). BLM's rules and regulations outlined in 43 CFR §3162.4-2, §3162.5-1(a) and §3162.5-2 (d) Control of wells, Onshore Oil and Gas Orders Nos. 2 and 7, and the Gold Book have been developed to address potential impacts to ground water from the drilling and completion of oil and gas wells, including the construction and use of reserve and production pits. Specifically, §3162.5-2 (d) Protection of fresh water and other minerals requires that the operator shall isolate freshwater-bearing and other usable water containing 5,000 ppm or less dissolved solids and Onshore Order No. 2 increases the requirement by establishing a 10,000 ppm total dissolved solids (TDS) threshold for protection of usable water. Concurrent with submittal of an application for a permit to drill (APD), or any proposed surface disturbing activity, the lessee/operator must provide the BLM Authorized Officer (AO) protective measures, which adequately address protection of the DWSPZ or other usable ground water zones. If operator proposed measures are considered insufficient to adequately protect the water zones, the AO will incorporate additional protective measures as condition(s) of approval (COAs). During further analysis at time of APD approval, the BLM would attach IM No. UT 2010-055, Attachment G (Utah Drinking Water Source Protection Zone COA). Geophysical logs will be required in order to determine cement integrity and subsequent protection /isolation of usable ground water resources. Upon well completion, additional testing may be required to verify well bore integrity for protection of usable ground water resources. Testing results will be evaluated to determine if effective implementation of mitigation measures has been achieved.

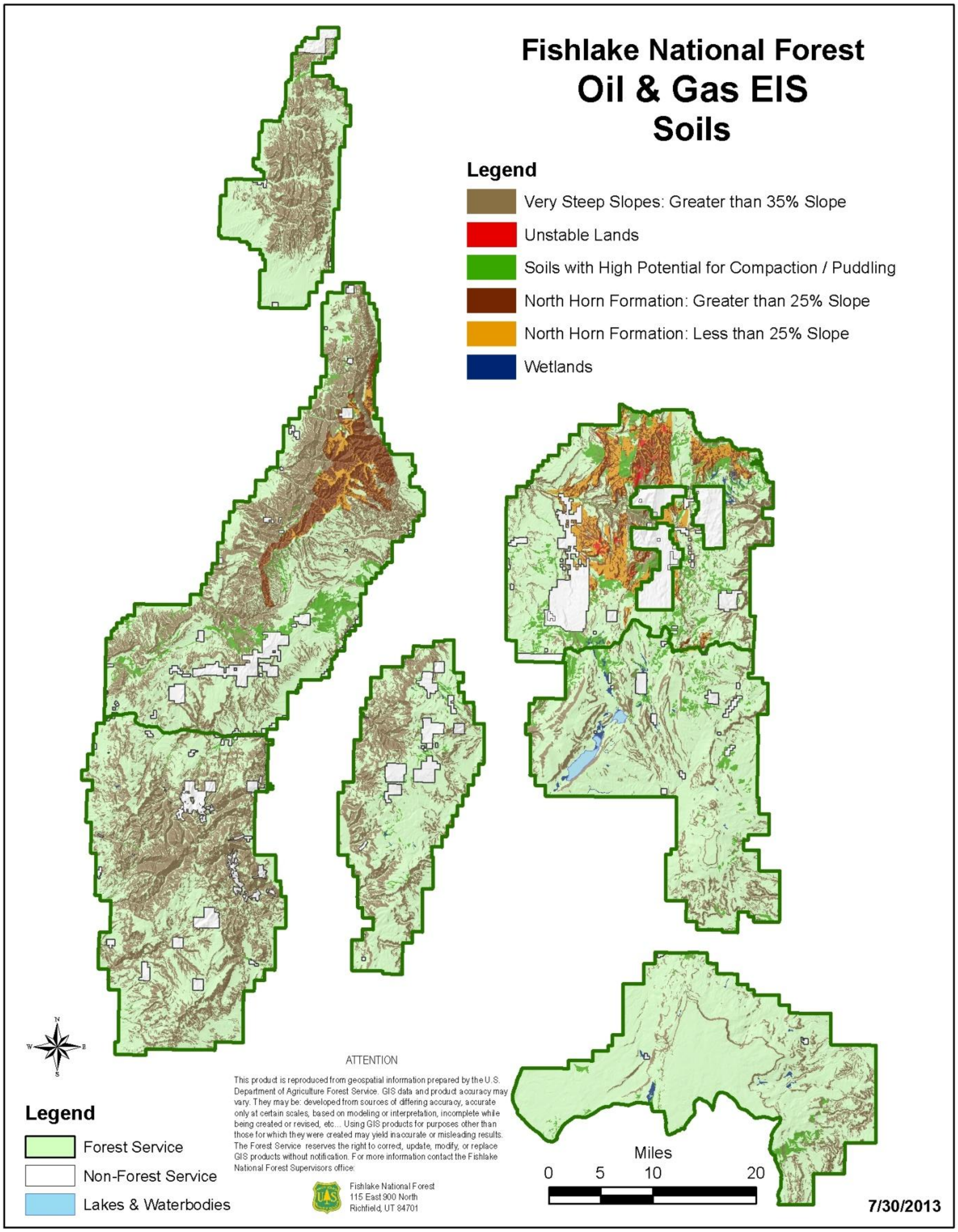
	<u>Existing Transient Non-Community Water Systems – Zones T2 and T4:</u> This lease (or a portion thereof) is within Drinking Water Source Protection Zones designated as a transient non-community water system which does not serve 25 of the same nonresident persons per day for more than 6 months per year by the Utah Division of Drinking Water. The Transient System T2 protection zone for existing wells or springs is the area within a 250-day ground-water time of travel to the wellhead, spring or margin of the collection area, the boundary of the aquifer(s) which supplies water to the ground-water source, or the ground-water divide, whichever is closer. The Transient System T4 protection zone for existing wells or springs is the area within a 10-year ground-water time of travel to the wellhead, spring or margin of the collection area, the boundary of the aquifer(s) which supplies water to the ground-water source, or the ground-water divide, whichever is closer. Compliance with R309-600 is voluntary for existing transient non-community water systems. However, all new ground water sources (including transient non-community systems) must submit to the DDW a Preliminary Evaluation Report (R309-600-13(2)) and a Drinking Water Source Protection Plan (R309-600-7(1)) which designates ground water source protection zones 1 through 4. Protection of the zones T2 and T4 must also comply with LEASE NOTICE – Groundwater Protection Zones 1-4.S <u>Surface Water Protection Zones 1-4:</u> There currently are no Surface Water Protection Zones within the lands being proposed for leasing. But if any are created then the following Lease Notice for these zones would apply. This lease (or a portion thereof) is within public Drinking Water Source Protection Zones 1, 2, 3, and/or 4. Before application for a permit to drill (APD) submittal or any proposed surface disturbing activity, the lessee/operator must contact the BLM field office and the public water system manager to determine any zoning ordinances, best management or pollution prevention measures or physical controls that may be required within the protection zone. Drinking Water Source Protection plans are developed by the public water systems under the requirements of R309-605-7, Drinking Water Source Protection for Surface Sources (Utah Administrative Code). There may also be county ordinances in place to protect the source protection zones, as required by Section 19-4-113 of the Utah Code. Incorporated cities and towns may also protect their drinking water sources using Section 10-8- 15 of the Utah Code. Cities and town have the extraterritorial authority to enact ordinances to protect a source of drinking water ... "For 15 miles above the point from which it is taken and for a distance of 300 feet on each side of such stream..." Class I cities (greater than 100,000 population) are granted authority to protect their entire watersheds. Some public water sources qualify for monitoring waivers which reduce their monitoring requirements for pesticides and volatile organic chemicals (VOCs). Exploration, drilling and production activities within a Source Protection Zone could jeopardize these waivers, thus requiring increased monitoring. Contact the public water system to determine what effect your activities may have on their monitoring waivers. Please be aware of other state rules to protect surface and ground water, including Utah Division of Water Quality Rules R317 Water Quality Rules; and Rules of the Utah Division of Oil, Gas and Mining, Utah Oil and Gas Conservation Rules R649. During further analysis at time of APD the BLM would attach IM No. UT 2010-055, Attachment G - Utah Drinking Water Source Protection Zone COA. At the time of development, drilling operators will additionally conform to the BLM operational regulations and Onshore Oil and Gas Order No. 7 (which prescribes measures required for the handling of produced water to ensure the protection of surface and ground water sources) and the Surface Operating Standards and Guidelines for Oil and Gas Development, The Gold Book, Fourth Edition-Revised 2007 (which provides information and requirements for conducting environmentally responsible oil and gas operations).

	<u>Sole Source Aquifers</u> There currently are no Sole Source Aquifers within the lands being proposed for leasing. But if any are created then the following Lease Notice for these zones would apply. This lease (or a portion thereof) is within Sole Source Aquifer Protection zone designated by the Environmental Protection Agency (EPA). BLM's rules and regulations outlined in 43 CFR §3162.4-2, §3162.5-1(a) and §3162.5-2 (d) Control of wells, Onshore Oil and Gas Orders Nos. 2 and 7, and the Gold Book have been developed to address potential impacts to ground water from the drilling and completion of oil and gas wells, including the construction and use of reserve and production pits. Specifically, §3162.5-2 (d) Protection of fresh water and other minerals requires that the operator shall isolate freshwater-bearing and other usable water containing 5,000 ppm or less dissolved solids and Onshore Order No. 2 increases the requirement by establishing a 10,000 ppm total dissolved solids (TDS) threshold for protection of usable water. During further analysis at time of APD the BLM would attach IM No. UT 2010-055, Attachment G - Utah Drinking Water Source Protection Zone COA. Concurrent with submittal of an application for a permit to drill (APD), or any proposed surface-disturbing activity, the lessee/operator must provide the BLM Authorized Officer (AO) protective measures, which adequately address protection of the Sole Source Aquifer and other usable ground water zones. If operator proposed measures are considered insufficient to adequately protect the water zones, the AO will incorporate additional protective measures as condition(s) of approval (COAs). Geophysical logs will be required in order to determine cement integrity and subsequent protection/isolation of usable ground water resources. Upon well completion, additional testing may be required to verify well bore integrity for protection of usable ground water resources. Testing results will be evaluated to determine if effective implementation of mitigation measures has been achieved. <u>Floodplains and Wetland (EO 11988; EO 11990):</u> The lessee is hereby notified that this lease may contain land within a riparian or wetland ecosystem. All activities within this area may be precluded or highly restricted in order to comply with Executive Order 11988 - Floodplain Management and Executive Order 11990 - Protection of Wetlands, in order to preserve and restore or enhance the natural and beneficial values served by floodplains and wetlands. Occupancy and use of lands within riparian or wetland areas, as proposed in a Surface Use Plan of Operations, will be considered in an environmental analysis and mitigation measures deemed necessary to protect these areas identified. These areas are to be avoided to the extent possible, or special measures such as road design, well pad size and location or directional drilling, may be made part of the permit authorizing the activity.

Appendix B

Resource Maps


Fishlake National Forest
Oil & Gas EIS
Inventoried Roadless Areas
Legend
Inventoried Roadless Areas
N
W
E
S
Legend
Forest Service
Non-Forest Service
Lakes & Waterbodies
ATTENTION
This product is reproduced from geospatial information prepared by the U.S. Department of Agriculture Forest Service. GIS data and product accuracy may vary. They may be: developed from sources of differing accuracy, accurate only at certain scales, based on modeling or interpretation, incomplete while being created or revised, etc... Using GIS products for purposes other than those for which they were created may yield inaccurate or misleading results. The Forest Service reserves the right to correct, update, modify, or replace GIS products without notification. For more information contact the Fishlake National Forest Supervisors office:
Fishlake National Forest
115 East 900 North
Richfield, UT 84701
Miles
0 5 10 20
7/30/2013


Fishlake National Forest
Oil & Gas EIS
Soils
Legend
Very Steep Slopes: Greater than 35% Slope
Unstable Lands
Soils with High Potential for Compaction / Puddling
North Horn Formation: Greater than 25% Slope
North Horn Formation: Less than 25% Slope
Wetlands
Legend
Forest Service
Non-Forest Service
Lakes & Waterbodies
ATTENTION
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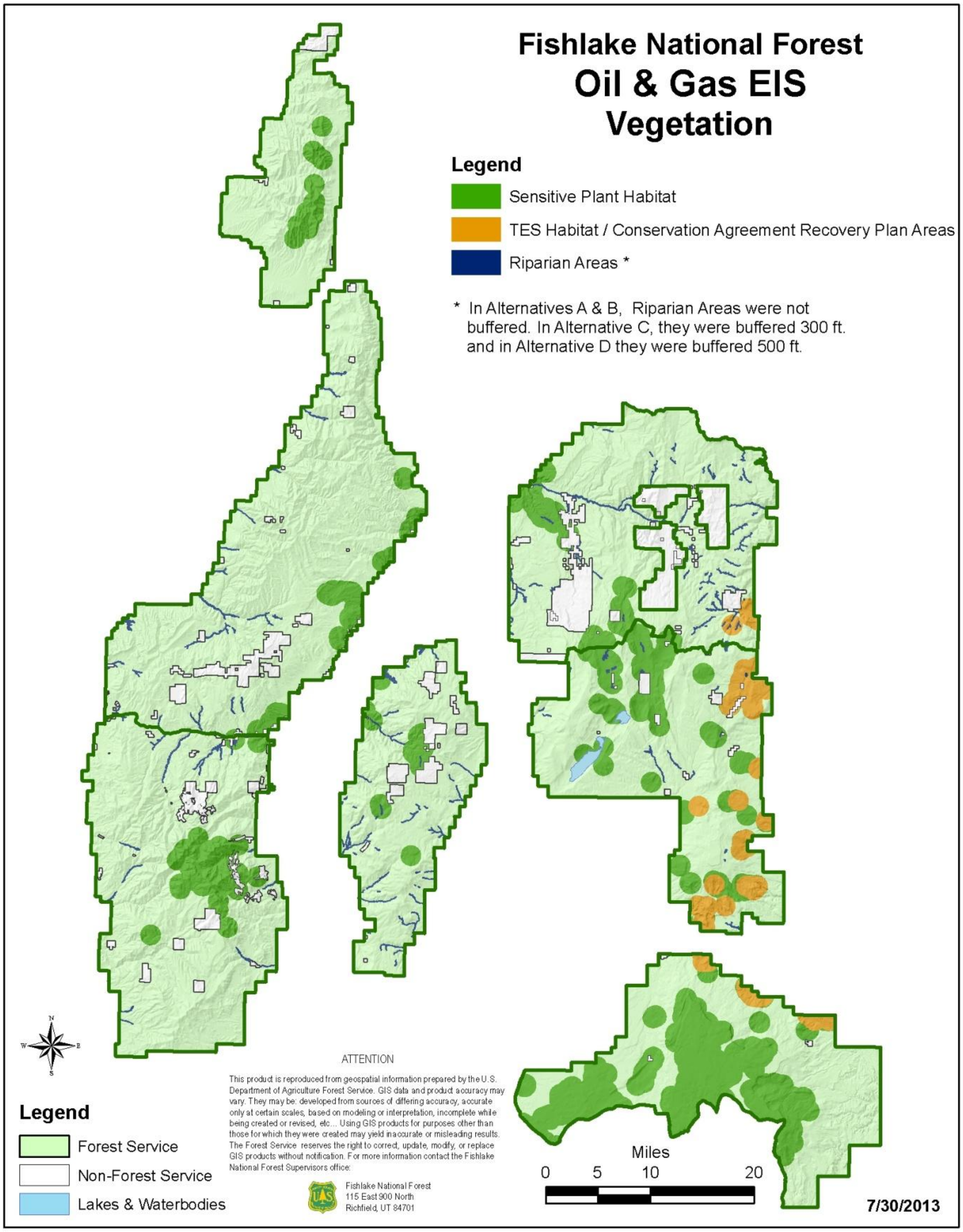
Fishlake National Forest
115 East 900 North
Richfield, UT 84701
Miles
0 5 10 20
7/30/2013



Fishlake National Forest
Oil & Gas EIS
Vegetation
Legend
Sensitive Plant Habitat
TES Habitat / Conservation Agreement Recovery Plan Areas
Riparian Areas *
* In Alternatives A & B, Riparian Areas were not buffered. In Alternative C, they were buffered 300 ft. and in Alternative D they were buffered 500 ft.
N
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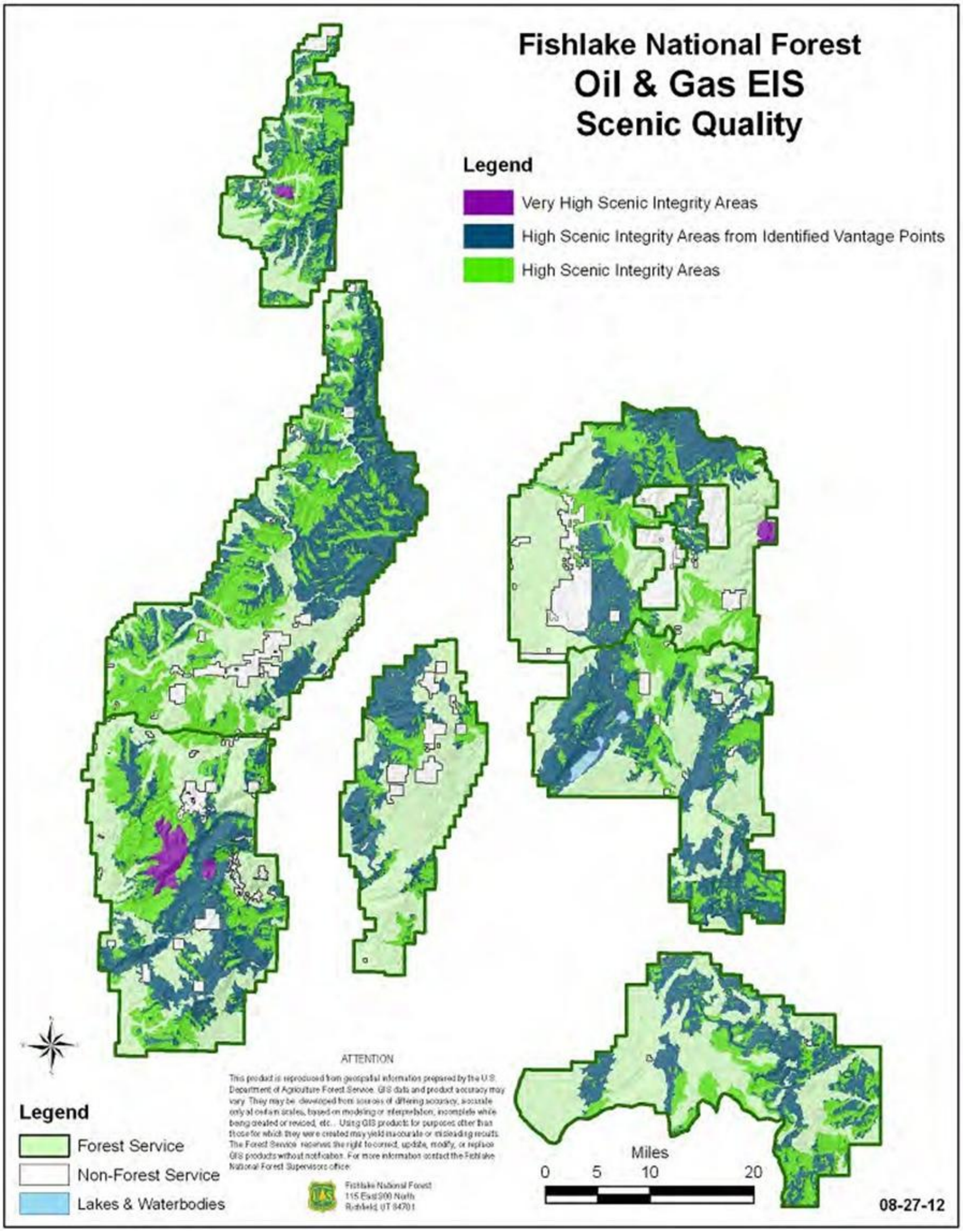
Legend
Forest Service
Non-Forest Service
Lakes & Waterbodies
ATTENTION
This product is reproduced from geospatial information prepared by the U.S. Department of Agriculture Forest Service. GIS data and product accuracy may vary. They may be: developed from sources of differing accuracy, accurate only at certain scales, based on modeling or interpretation, incomplete while being created or revised, etc... Using GIS products for purposes other than those for which they were created may yield inaccurate or misleading results. The Forest Service reserves the right to correct, update, modify, or replace GIS products without notification. For more information contact the Fishlake National Forest Supervisors office:
Fishlake National Forest
115 East 900 North
Richfield, UT 84701
Miles
0 5 10 20
7/30/2013


Fishlake National Forest
Oil & Gas EIS
Scenic Quality
Legend
Very High Scenic Integrity Areas
High Scenic Integrity Areas from Identified Vantage Points
High Scenic Integrity Areas
ATTENTION
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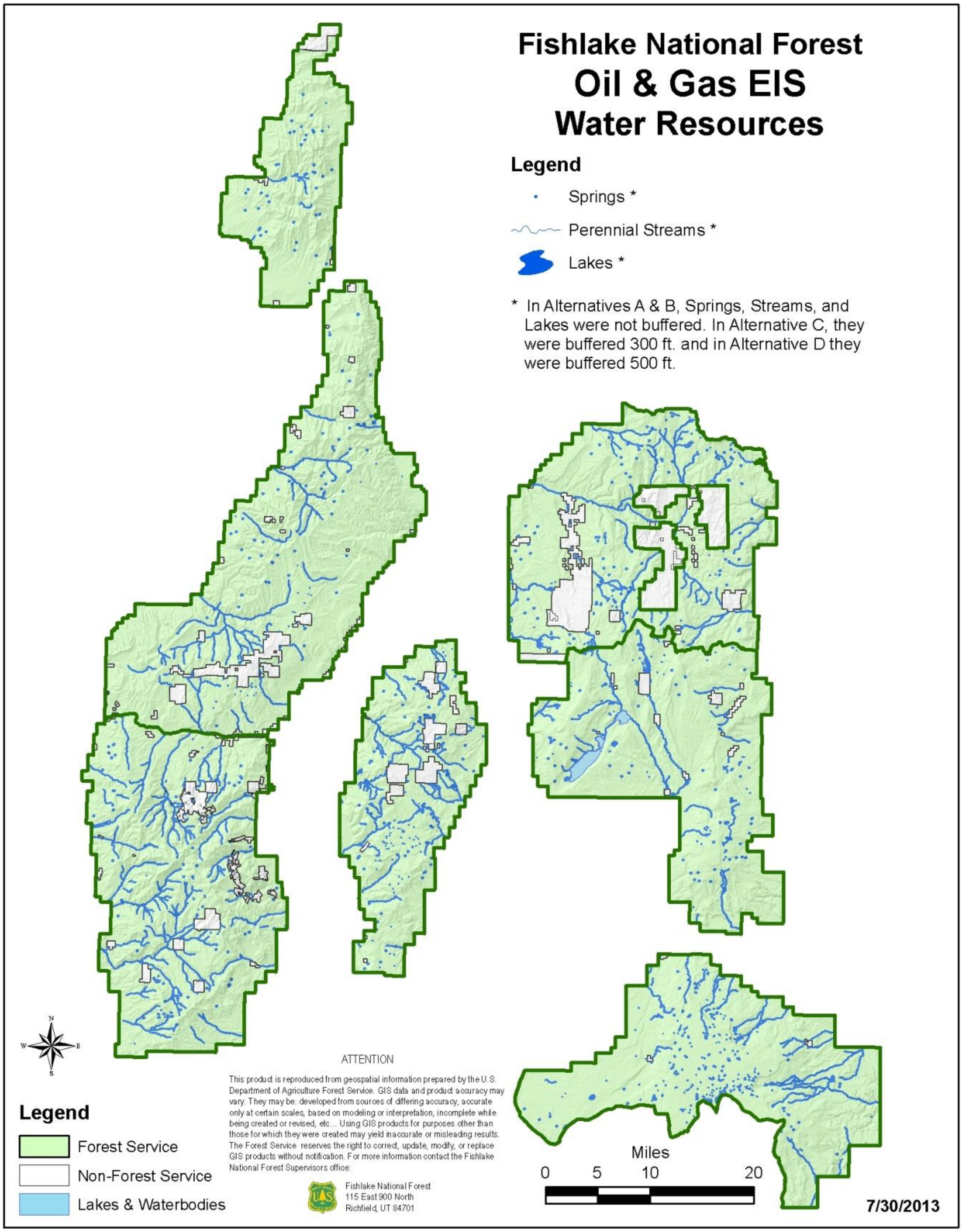
Fishlake National Forest
115 East 900 North
Richfield, UT 84701
Legend
Forest Service
Non-Forest Service
Lakes & Waterbodies
Miles
0 5 10 20
08-27-12


Fishlake National Forest
Oil & Gas EIS
Water Resources
Legend
Springs *
Perennial Streams *
Lakes *
* In Alternatives A & B, Springs, Streams, and Lakes were not buffered. In Alternative C, they were buffered 300 ft. and in Alternative D they were buffered 500 ft.
N
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Legend
Forest Service
Non-Forest Service
Lakes & Waterbodies
ATTENTION
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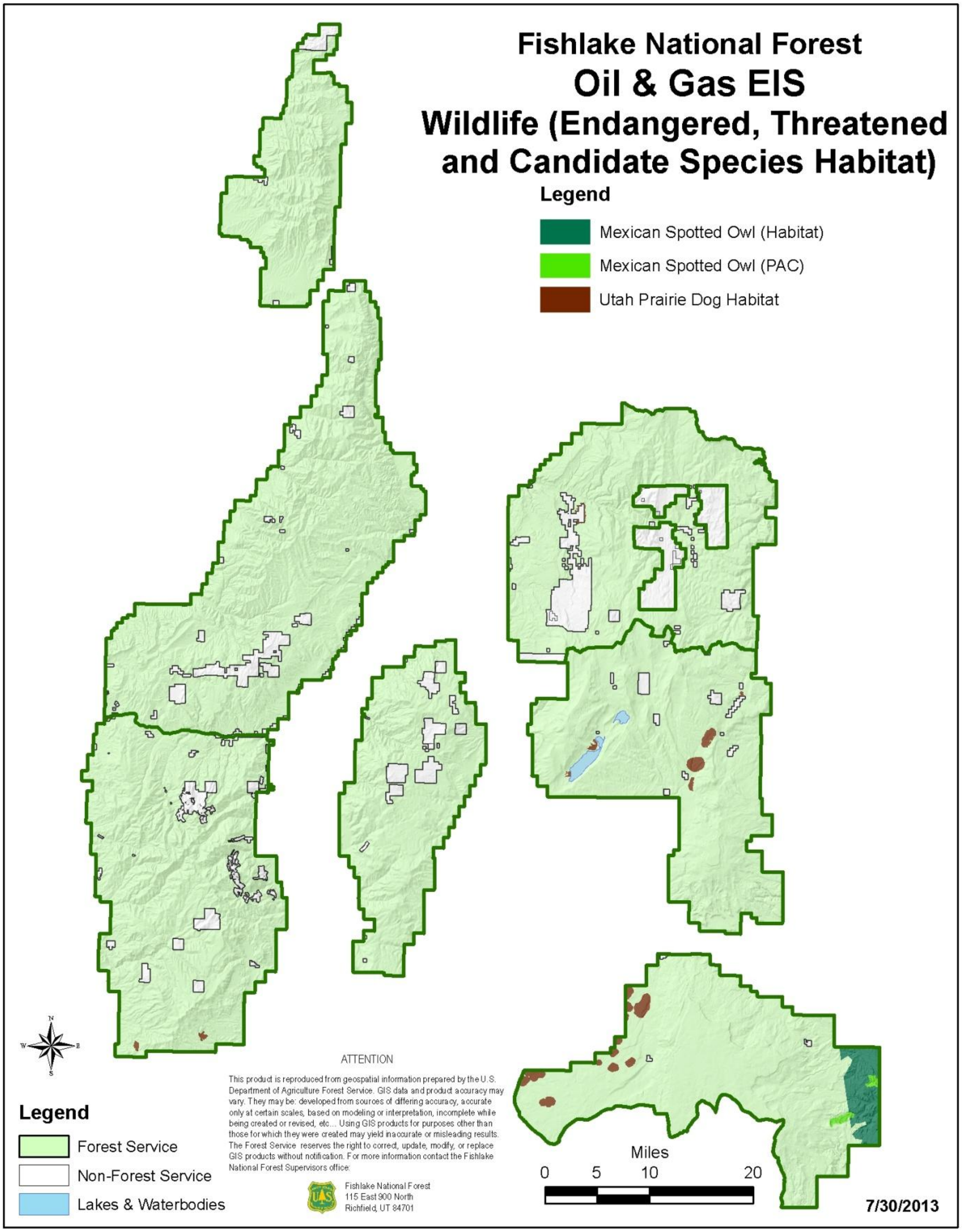
Fishlake National Forest
115 East 900 North
Richfield, UT 84701
Miles
0 5 10 20
7/30/2013


Fishlake National Forest
Oil & Gas EIS
Wildlife (Endangered, Threatened and Candidate Species Habitat)
Legend
Mexican Spotted Owl (Habitat)
Mexican Spotted Owl (PAC)
Utah Prairie Dog Habitat
Legend
Forest Service
Non-Forest Service
Lakes & Waterbodies
ATTENTION
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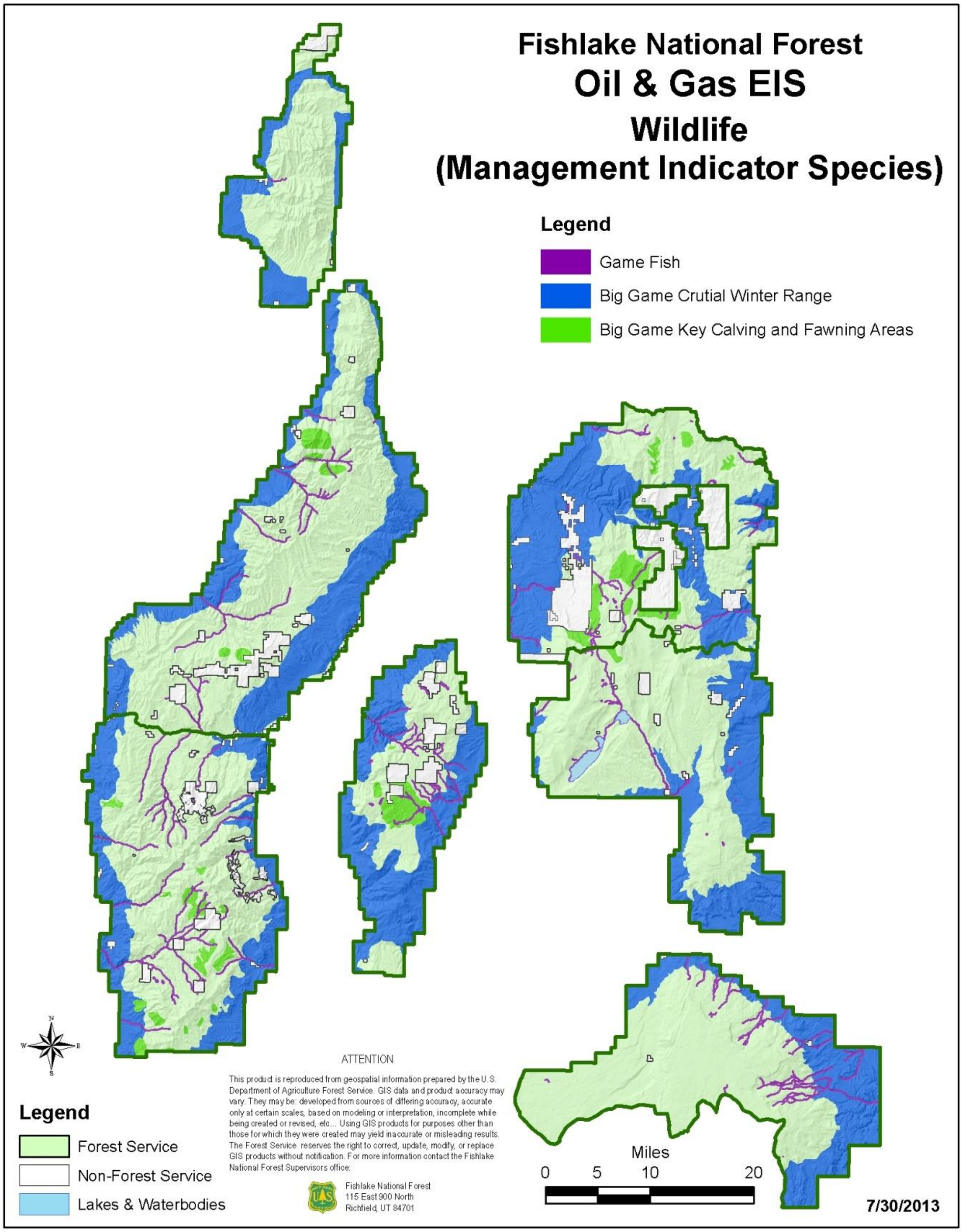
7/30/2013


Fishlake National Forest
Oil & Gas EIS
Wildlife
(Management Indicator Species)
Legend
Game Fish
Big Game Crutial Winter Range
Big Game Key Calving and Fawning Areas
N
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Legend
Forest Service
Non-Forest Service
Lakes & Waterbodies
ATTENTION
This product is reproduced from geospatial information prepared by the U.S. Department of Agriculture Forest Service. GIS data and product accuracy may vary. They may be: developed from sources of differing accuracy, accurate only at certain scales, based on modeling or interpretation, incomplete while being created or revised, etc... Using GIS products for purposes other than those for which they were created may yield inaccurate or misleading results. The Forest Service reserves the right to correct, update, modify, or replace GIS products without notification. For more information contact the Fishlake National Forest Supervisors office:
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0 5 10 20
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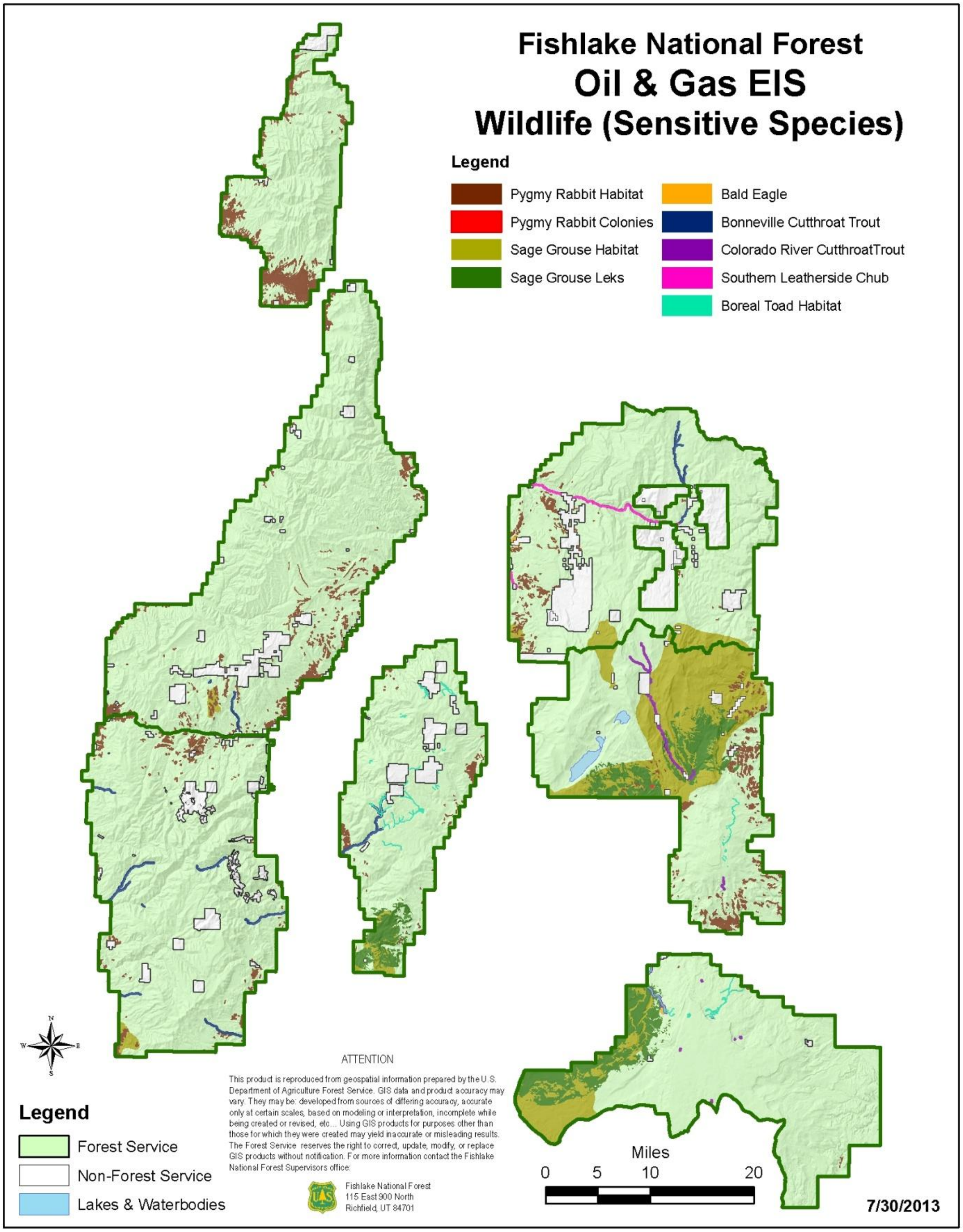
Fishlake National Forest
Oil & Gas EIS
Wildlife (Sensitive Species)
Legend
Pygmy Rabbit Habitat
Pygmy Rabbit Colonies
Sage Grouse Habitat
Sage Grouse Leks
Bald Eagle
Bonneville Cutthroat Trout
Colorado River CutthroatTrout
Southern Leatherside Chub
Boreal Toad Habitat
Legend
Forest Service
Non-Forest Service
Lakes & Waterbodies
ATTENTION
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Miles
0 5 10 20
7/30/2013

APPENDIX C – REASONABLY FORESEEABLE DEVELOPMENT SCENARIO

Reasonably Foreseeable Development Scenario for Oil and Gas

Fishlake National Forest

Prepared By:

James A. Foster

(Signature)

GEOLOGIST

(Title)

June 11, 2007

(Date)

Technical Review:

[illegible]

(Signature)

Petroleum Engineer

(Title)

June 12, 2007

(Date)

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FIGURES

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MAPS

SUMMARY

A reasonably foreseeable development scenario for oil and natural gas is developed for the Fishlake National Forest based on the assumption that all potentially productive areas can be open under standard lease terms and conditions, except those areas designated as closed to leasing by law, regulation or executive order. It covers a time period of 15 years and includes all lands within the Forest boundaries regardless of ownership and adjacent non forest lands where oil and gas activity may impact Forest lands.

Several defined oil and gas plays cover parts of the area of interest but exploration of Forest lands has been minimal. The Covenant Oil Field on BLM lands is approximately 4 miles west of the Richfield Ranger District and its discovery in 2004 greatly increased interest in the oil and gas potential of the surrounding area including parts of the Fishlake National Forest. Few wells have been drilled on Forest lands and only one oil and gas lease currently exists.

Oil and gas occurrence potential in the eastern part of the Fillmore Ranger District and the northern part of the Richfield Ranger District is rated as high with a high degree of certainty based on identified plays and established production in the Covenant Field and in Cretaceous reservoirs in Carbon and Emery Counties. Other parts are rated as having only moderate or low potential for oil and natural gas occurrence. The south central part of the Forest has a low potential for oil and natural gas occurrence but may have a high potential for carbon dioxide gas occurrence.

The Forest area with the highest oil and gas development potential is the eastern part of the Fillmore Ranger District and the extreme northern part of the Beaver Ranger District. This rating is based on the discovery of the Covenant Field and the currently high lever of interest in the Sevier Frontal Zone Play. The eastern part of the Fremont River Ranger District is also rated as having a high development potential based largely on the Permo-Triassic Unconformity Play (including the nearby Upper Valley Oil Field) but questions concerning source rocks, migration paths and timing, carbon dioxide gas flushing and the results of previous exploration efforts detract from this area. The northeastern part of the Richfield Ranger District has moderate potential for gas development resulting from Cretaceous sandstone and coalbed methane plays and current production in Emery and Carbon Counties. Remaining parts of the Forest are rated as having low potential for development based on hypothetical plays, carbon dioxide flushing and results of previous exploration efforts.

A baseline reasonable foreseeable development scenario projects 45 exploration wells (3 wells each year) for the Forest during the next 15 years. These exploration wells may result in the discovery of two new oil or gas fields. One of these will likely be in the Sevier Frontal Zone Play and like the Covenant Field will contain 10 development wells.

The other field may be similar to the Upper Valley Field in the Dixie National Forest but consisting of 20 development wells. This scenario projects a total of 73 wells during the next 15 years.

Total gross disturbance from oil and gas exploration and production operations is projected to be 1,420.9 acres. At the end of the 15 year analysis period net disturbance is estimated to be 573.0 acres.

INTRODUCTION

The recently signed Memorandum of Understanding (MOU) between the Bureau of Land Management (BLM) and the Forest Service (FS) states that BLM has sole responsibility to provide Reasonably Foreseeable Development Scenarios (RFD) for oil and gas leasing on National Forest System (NFS) lands, if requested, and outlines what should be included in the RFD. The MOU further states that the RFD will follow the Interagency Reference Guide "Reasonably Foreseeable Development Scenarios and Cumulative Effects Analysis". Following this, the BLM Utah State Office and the Fishlake National Forest are preparing a RFD for oil and gas for the Fishlake National Forest (FNF).

The RFD will draw heavily from the report "*The Oil, Gas, Coalbed Gas, Carbon Dioxide, and Geothermal Resources of the Fishlake National Forest, Southwestern Utah*" prepared by the Utah Geological Survey (UGS, 2004) and an addendum (UGS, 2005), but will include some additional resource information. It will be consistent with BLM Handbook 1624-1 and BLM Instructional Memorandum (IM) 2004-089 as well as The Interagency Reference Guide. IM 2004-089 requires that the RFD project a baseline scenario of activity assuming all potentially productive areas are open to leasing under standard lease terms and conditions, except those areas designated as closed to leasing by law, regulation or executive order. The RFD Scenario presented here is a reasonable, technical, and scientific estimate of anticipated oil and gas activity using the best information currently available. The baseline scenario will be adjusted according to each alternative developed in the planning process in order to determine cumulative impacts from oil and gas activity.

The FNF includes four separate but closely spaced areas consisting of the Fillmore, Beaver, Richfield and Fremont River Ranger Districts (RDs). It should be noted that the recently designated Fremont River RD includes the old Loa RD of the FNF as well as the former Teasdale RD of the Dixie NF. The baseline scenario will be for all lands, regardless of ownership, within all RDs and a reasonable distance outside their boundaries where the cumulative effects of oil and gas activity may impact FNF lands and for a time period of 15 years.

DESCRIPTION OF GEOLOGY

The Utah Geological Survey report referenced above gives a detailed description of the general geology of the FNF and surrounding area. A brief summary is given here and the interested reader is referred to the referenced UGS reports (2004, 2005), Stokes (1987) and Hintze (1988) for more detailed discussions of geological relationships.

The FNF covers parts of three physiographic provinces, from west to east, the Basin and Range, Basin and Range/Colorado Plateau Transition Zone and the Colorado Plateau (UGS, 2004). With elevations generally exceeding 6,000 feet the FNS includes mostly mountain ranges and high plateaus (Tushar, Pavant and Canyon ranges and the Sevier, Fishlake and Wasatch plateaus). The intervening valleys contain BLM, Private and State of Utah lands.

Stratigraphy, Source Rocks and Reservoirs

Figure 1 shows the general stratigraphy in the area of interest. Although not listed in Figure 1, most of south central Utah is underlain by Early Proterozoic metamorphic rocks which are overlain by a typical Cambrian sequence of basal sandstone, shale and carbonate rocks. Farther south, rocks of Late Proterozoic age are present and contain potential petroleum source rocks. Carbonate rocks of Ordovician and Silurian age are present in the northwestern part of the area but are absent in other parts where a major unconformity separates Cambrian and Devonian age rocks. Early Devonian rocks are present in the northwestern part of the area but thin rapidly to the east and south. Middle and Late Devonian rocks present throughout most of the area were deposited in a shallow marine environment near a fluctuating shoreline.

Marine conditions existed in the FNF area during the Mississippian Period when the Redwall Limestone was deposited. This limestone and dolomitized limestone unit, approximately 800 feet thick under the Wasatch Plateau, has good reservoir characteristics in some areas and has been a major producer of oil and gas at the Lisbon Field in northern San Juan County, Utah. Organic-rich and phosphatic units of Mississippian age in western Utah and eastern Nevada have been recognized as promising petroleum source rocks (Sandberg and Gutschick, 1984). During late Mississippian time, the sea retreated and a regolith of reddish soils formed on the exposed limestone. Early Pennsylvanian seas transgressed the area resulting in a significant unconformity separating the upper Mississippian regolith and lower Pennsylvanian shallow marine sediments. Later, the marine Callville Limestone was deposited in the western part of the FNF area while the eastern part remained a positive area. The entire FNF area was exposed to erosion during latest Pennsylvanian time. As a result of the repeated transgressions and regressions, rocks of Pennsylvanian age show considerable variations in thickness ranging from zero to 500 feet. Crustal instability continued throughout the Permian Period producing a series of eastward marine transgressions and subsequent withdrawals across the area of interest. Major Permian units include, in ascending order, Pakoon Limestone, Cedar Mesa Sandstone, Toroweap Formation and Kaibab Limestone (Black Box Dolomite in Figure 1). The Kaibab Limestone has been a prolific oil producer at the Upper Valley Field in Garfield County.

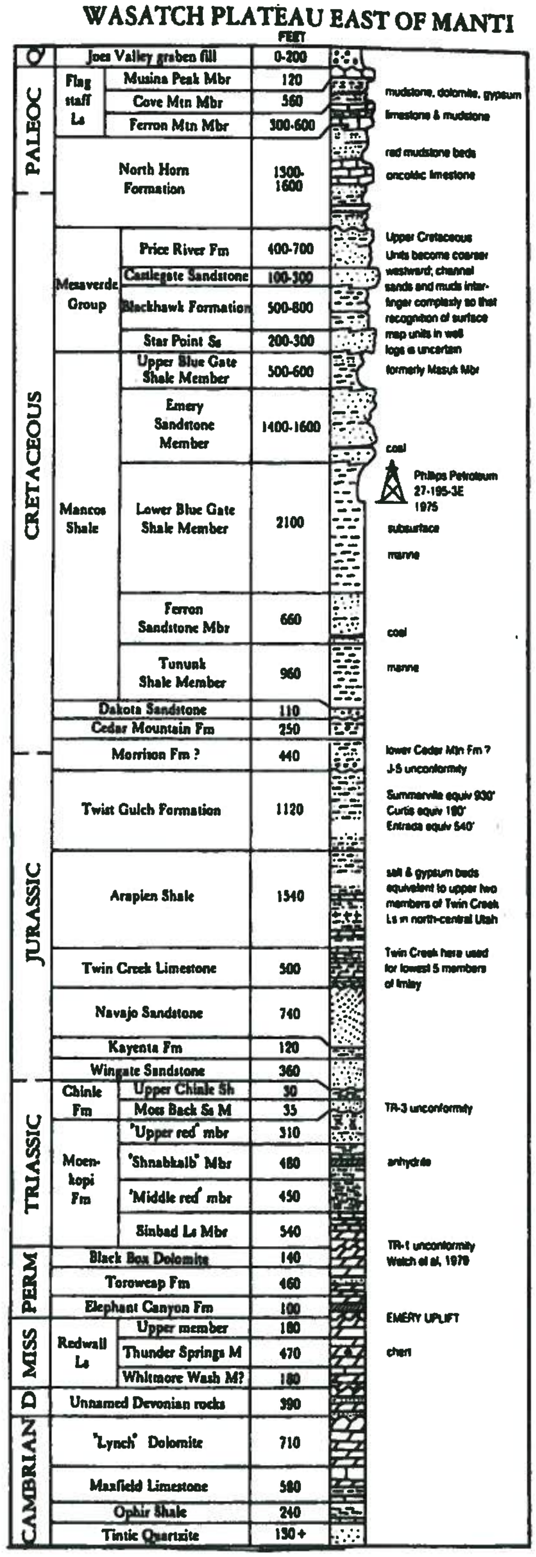


Figure 1. Representative Stratigraphic Column. From Hintze, 1988.

The Kaibab Limestone is unconformably overlain by the Moenkopi Formation of Triassic age which consists of as many as four members in south central Utah including limestone and generally red siltstone and fine-grained ripple-marked sandstone. The clastic units represent fluvial material deposited in a flood plain to tidal flat environment. Hydrocarbons have been produced from Moenkopi reservoirs in the Virgin, Upper Valley and Grassy Trail fields. A major unconformity separates the Moenkopi from the Late Triassic Chinle Formation which consists of continental red-bed deposits. The lower part of the Chinle is named the Shinarump Member and represents discontinuous channel deposits cut into the upper part of the Moenkopi. It possesses good reservoir characteristics in some areas. The upper, Petrified Forest Member contains colorful mudstones and muddy sandstones of continental origin. The thick Jurassic section includes, in ascending order, the Wingate, Kayenta, Navajo, Twin Creek, Arapien, Entrada, Curtis, Summerville and Morrison formations but all units may not be present at a given location and they vary considerably in thickness. Figure 1 includes the Entrada, Curtis and Summerville formations as the Twist Gulch Formation. Several of the units are eolian sandstones (Wingate, Navajo and Entrada) exhibiting spectacular cross-bedding at certain locations and formed in arid coastal environments. The Twin Creek Limestone, Arapien Shale, Curtis and Summerville formations represent shallow marine environments. Wolverine Gas and Oil's discovery of oil in the Navajo Sandstone at the Covenant Field in 2004 sparked a revival of leasing and exploration activity in the area surrounding and including parts of the FNF and discoveries of gas in the Wingate and Entrada formations at Flat Rock and Peter's Point fields have increased interest in the Jurassic eolian sandstones as exploration targets. The Twin Creek Limestone is hydrocarbon-bearing in the Utah-Wyoming Overthrust Belt in northeastern Utah and southwestern Wyoming.

Rocks of Cretaceous age in south central Utah occur in two basins separated by an east-west trending salient where Cretaceous rocks are absent (UGS, 2004, p.15). This salient underlies the southern part of the FNF and the following summary applies to stratigraphic relationships within the northern basin where fluctuations of the Cretaceous shoreline resulted in east-west facies changes. The oldest Cretaceous unit is the Cedar Mountain Formation which is overlain by the Dakota Sandstone. The two units represent changing fluvial and marine environments that existed as the Cretaceous seas transgressed the region. The thick Mancos Shale overlies the Dakota Sandstone and includes, from oldest to youngest, Tununk Shale, Ferron Sandstone, Lower Blue Gate Shale, Emery Sandstone and Upper Blue Gate Shale. The shale members were deposited during periods of maximum transgression whereas the two sandstone members represent regressive cycles. The Mesaverde Group represents the youngest Cretaceous sediments in the northern basin. The lowermost units of the group consist of nearshore marine sandstones which grade upward through paludal and alluvial plain deposits into coarse-grained alluvial fan deposits. The shifting marine shoreline during Cretaceous time resulted in coal formation in several different units (Dakota Sandstone, Ferron Sandstone, Emery Sandstone and lower Mesaverde) which, along with associated carbonaceous shales, served as source rocks for the widespread gas occurrences in the area north and east of FNF.

Sedimentary rocks of Tertiary age are thickest in the northern part of FNF where the units (North Horn, Colton, Green River and Flagstaff formations) represent fluvial and lacustrine sedimentation. Some of these rocks are hydrocarbon bearing in the Uinta Basin north and east of FNF but have not been attractive targets in the forest area proper. A period of uplift and erosion followed deposition of Eocene Strata and preceded Oligocene and lower Miocene volcanic activity. The Marysvale Volcanic Field covers a large area in the southern part of the FNF and consists largely of local accumulations of lava and volcanic debris flows that formed several stratovolcanos (Hintze, 1988). The original volcanic structures have been modified by later faulting and erosion but according to Hintze (1988, p. 67) thicknesses are in the 6,000 feet range. The presence of the large volcanic pile has discouraged exploration for oil and gas resources in the area and heat resulting from the activity acting on carbonate rocks in the subsurface may be the source of carbon dioxide gas encountered in some wells (Anonymous, 1984).

Structure

The eastern portion of the FNF is characterized by typical Colorado Plateau structures with gently warped strata cut in places by high angle normal faults. Deformation generally increases to the west in the Colorado Plateau/Basin and Range Transition Zone and Basin and Range Province. The Sevier fold-and-thrust belt near the central part of the FNF area is of special interest because the frontal zone of the belt contains numerous structures capable of trapping hydrocarbons. This belt is a linear group of closely spaced thrust faults and related folds that extends from the Las Vegas, Nevada area to the Idaho state line (Armstrong, 1968) and is a segment of the larger Cordilleran retroarc fold-and thrust belt which formed during late Mesozoic through Eocene time and extends northward into Canada (DeCelles and Coogan, 2006). In central Utah the Sevier belt consists of the Canyon Range, Pavant, Paxton and Gunnison thrust systems, which together, accommodated at least 220 km of total crustal shortening (DeCelles and Coogan, 2006). The Canyon Range thrust is exposed in the Canyon Range mountains, the Pavant sheet in both the Canyon Range and Pavant Range mountains whereas the two deeper thrust systems are not exposed in the FNF area.

Summary of Oil and Gas Plays

A play is defined as an area of known or suspected oil and or gas accumulations sharing similar geologic, geographic, and temporal properties, such as oil/gas source rocks, migration pathways, timing, trapping mechanisms, and oil/gas (hydrocarbon) type. The geographic limit of each play represents the limits of the geologic elements that define the play.

Several oil and gas plays described by the U. S. Geological Survey (USGS) or the Utah Geological Survey (UGS) extend into the FNF area and are listed below.

USGS 1995 National Assessment Plays:

1902- Late Paleozoic Play (hypothetical).
1907- Sevier Frontal Zone Play (hypothetical when defined).
2052- Emery Play (Ferron Sandstone coalbed gas).
2106- Permo-Triassic Unconformity Play.
2107- Cretaceous Sandstone Play.
2403- Late Proterozic and Cambrian Play (hypothetical).

USGS 2003 Uinta-Piceance Basin Assessment*:

502001- Ferron/Wasatch Plateau Total Petroleum System.
502002- Mesaverde Total Petroleum System.
502003- Mancos/Mowry Total Petroleum System (?).
502004- Phosphoria Total Petroleum System (?).

*Only those Petroleum Systems that include the southern Wasatch Plateau are listed.

UGS 2004 Fishlake National Forest Report:

2100- Cretaceous Coalbed Gas Plays.
2108- Paleozoic Devonian through Pennsylvanian Play.

USGS PLAYS (1995)

The Late Proterozic and Cambrian Play (2403) is a hypothetical play based on the discovery of shales rich in organic carbon in the Late Proterozic Chuar Group in the Grand Canyon. These potential source rocks extend into the subsurface of southern Utah and the play, as defined, covers the southern part of the FNF. Potential reservoirs are siltstones within the Chuar group, basal Cambrian sandstones and possibly other Paleozoic units. Tests of these units in The Circle Cliffs and Kaiparowits Basin encountered carbon dioxide gas but no hydrocarbons.

The Permo-Triassic Unconformity Play (2106) is so named because all known accumulations, shows and oil staining are associated with this unconformity, either above or below. The play covers a large area including the southern and eastern parts of the FNF. Several potential source rocks of Precambrian and Paleozoic age have been recognized but no single one has been positively identified with this play and reservoirs include the Kaibab Limestone (Permian) and the Timpoweap member of the Triassic Moenkopi Formation. The discovery of the Upper Valley field in Garfield County in 1964 stimulated a period of exploration in the area which yielded numerous oil shows but no other commercial production. Several wells drilled in the 1980s south of the FNF encountered carbon dioxide gas in reservoirs above and below the unconformity.

The hypothetical Late Paleozoic Play (1902) covers the extreme southwestern portion of FNF and is based on the possibility of reservoirs, traps and seals in upper Paleozoic units in western Utah. Sparse exploration drilling to date has not produced promising results. The Sevier Frontal Zone Play (1907) was defined as a hypothetical play in the 1995 assessment but has since been confirmed by several productive wells drilled by Wolverine Gas and Oil near the southern end of the play. The play area includes the deformed area near the leading edge of the Sevier Fold and Fault Belt. Production to date has been only from the Navajo Sandstone of Jurassic Age but other units may also be productive in some of the other structural traps in the zone. Little FNF land is included in this play.

The Cretaceous Sandstone Play (2107) includes the southeastern part of FNF on the Wasatch Plateau. Potential Reservoirs in this play include the Ferron Sandstone, marine and deltaic sandstones in the Mesaverde Group and Mancos Shale as well as the deeper Dakota Sandstone. All of these reservoirs have been productive north of the FNF on the Wasatch Plateau and in the Uinta Basin. Closely associated with the Cretaceous Sandstone Play is the Wasatch Plateau-Emery Play (2052), a coalbed gas play based on coals in the Ferron Sandstone Member of the Mancos Shale. These coals have produced large volumes of gas in the Drunkards Wash, Helper and other fields in Carbon and Emery Counties.

All of the above plays were defined in the USGS 1995 National Assessment of United States Oil and Gas Resources (USGS, 1995). An updated assessment of resources in the Uinta–Piceance Basin of Utah and Colorado was published in 2003 and included the Wasatch Plateau which extends into the southeastern part of the FNF (USGS, 2003).

USGS PLAYS (2003)

The Phosphoria TPS (502004) includes all those occurrences inferred to have been derived from the Phosphoria Formation, and in some cases, older Paleozoic source rocks. The TPS was divided into two assessment units one of which (50200402) underlies the northwestern corner of the Richfield RD. Several fields north and east of FNF are tentatively assigned to the assessment unit including Grassy Trail Creek, Flat Canyon, Ferron, Greater Cisco, Bar X and San Arroyo. Reservoirs are mostly clastic units of Mesozoic age.

The Mancos/Mowry TPS is based on hydrocarbons generated in organic-rich zones in the Mowry Shale and the lower part of the Mancos Shale. Two assessment units are defined in Utah: Uinta Basin Continuous AU (50200362) and Uinta-Piceance Transitional and Migrated AU (502003363) neither of which includes FNF lands although some FNF lands are inside the TPS boundary. A pod of more mature source rock does occur near the base of the Mancos Shale, however, a short distance north of the Richfield RD (USGS, 2003). Gas generated in the Mancos/Mowry TPS have been produce mostly from reservoirs of lower Cretaceous and upper Jurassic ages.

Two Mesaverde TPS assessment units cover the southern Wasatch Plateau area and include the northeastern part of the Richfield RD. The two AUs are the Uinta-Piceance Basin Conventional Gas AU (50200201) and the Uinta Basin Blackhawk Formation Coalbed Gas AU (50200281). The former includes those areas were migrated gas is produced or has the potential to be produced from reservoirs in conventional structural and stratigraphic traps with discrete gas-water contacts. Reservoirs are primarily fluvial channel sandstones in the upper parts of the Mesaverde Group and the overlying Wasatch Formation. The latter AU relates to coalbed gas in coals within the Emery Sandstone Member of the Mancos Shale. The two AUs cover the same lands in the FNF.

The Ferron/Wasatch Plateau TPS (502001) includes most of the Wasatch Plateau with the eastern boundary being located a short distance west of outcrops of the Ferron Sandstone. The western boundary was drawn to include that area where Ferron coals are known or expected to exist and the southern boundary follows the known southern extent of the Ferron. This area includes the northeastern part of the Richfield RD. The TPS is divided into several AUs based on gas sourced by and contained within the coalbeds themselves, four of which are inside the Richfield RD, and one broader AU (50200101) where the coal derived gas has migrated into sandstone reservoirs and exists in conventional structural and stratigraphic traps.

UGS PLAYS (2004)

Utah Geological Survey Play 2108 (Paleozoic Devonian-Pennsylvanian Play) is based on oil shows and small amounts of production from mid paleozoic reservoirs (primarily the Redwall and Callville limestones). The play is subdivided into oil and gas and carbon dioxide plays. The only FNF lands in the oil and gas part of the play are in the extreme eastern part of the Richfield RD.

The UGS Cretaceous Coalbed Gas Plays (2100) is based on coalbed source rocks and reservoirs in the Emery and Ferron sandstones in the Wasatch Plateau area of the Richfield and Fremont River RDs. It is equivalent to the Uinta Basin Blackhawk Coalbed Gas AU (Mesaverde TPS) and the Conventional Ferron Sandstone Gas AU (Ferron/Wasatch TPS) described above.

As noted above UGS (2004) subdivided their play 2108 into a hydrocarbon portion and a carbon dioxide portion. They similarly show the same carbon dioxide area, which includes most of FNF, within USGS (1995) plays 2106 and 2403. This is based on the existence of several wells in the central and southern part of the state that encountered carbon dioxide gas in Paleozoic and lower Mesozoic Reservoirs and is usually attributed to flushing of oil and gas by carbon dioxide gas generated by volcanic heating of carbonate rocks during the Tertiary (Anonymous, 1984). At this point, too few wells have been drilled in this large area to definitively show which areas have been flushed and how efficient the flushing process has been.

PAST AND PRESENT OIL AND GAS EXPLORATION ACTIVITY

An undocumented map in BLM files indicates that several seismic surveys have been conducted in the FNF and surrounding areas. The majority of these surveys on FNF lands were in the eastern Richfield, Fremont River and Fillmore RDs. Very few are shown in the Beaver and southwestern Richfield RDs. The discovery of the Covenant Oil Field in 2004 led to renewed seismic activity in the general area but mostly on BLM, Private and State of Utah lands (UGS, 2005, p.14).

The FNF has not been a hot bed of exploratory drilling. UGS (2004) stated that 21 wells were drilled in the FNF between 1952 and 1984 and that none were drilled after 1984. Most, or all, of the wells were located in the eastern Richfield and the Fremont River RDs. There have been no discoveries on the FNF resulting in a success ratio of zero percent. If BLM, Private and State of Utah lands separating the RDs and a narrow surrounding area are included (approximately 10,000 square miles total), the total becomes 168 wells (IHS Energy Data, 2006) which equates to 0.6 well/township. One hundred and fifty six wells were drilled before discovery of the Covenant Field in 2004 which represents a success ratio of 0.6 percent. Figure 2 is a graph showing the number of wells permitted/year since 1947 in the forest and surrounding area. The number ranges from zero to a high of 14 wells in 1981. The graph indicates three periods of relatively increased activity: mid 1950s, late 1970s/early 1980s, and the present time. The average number of wells permitted each year between 1947 and 2004 was 2.74.

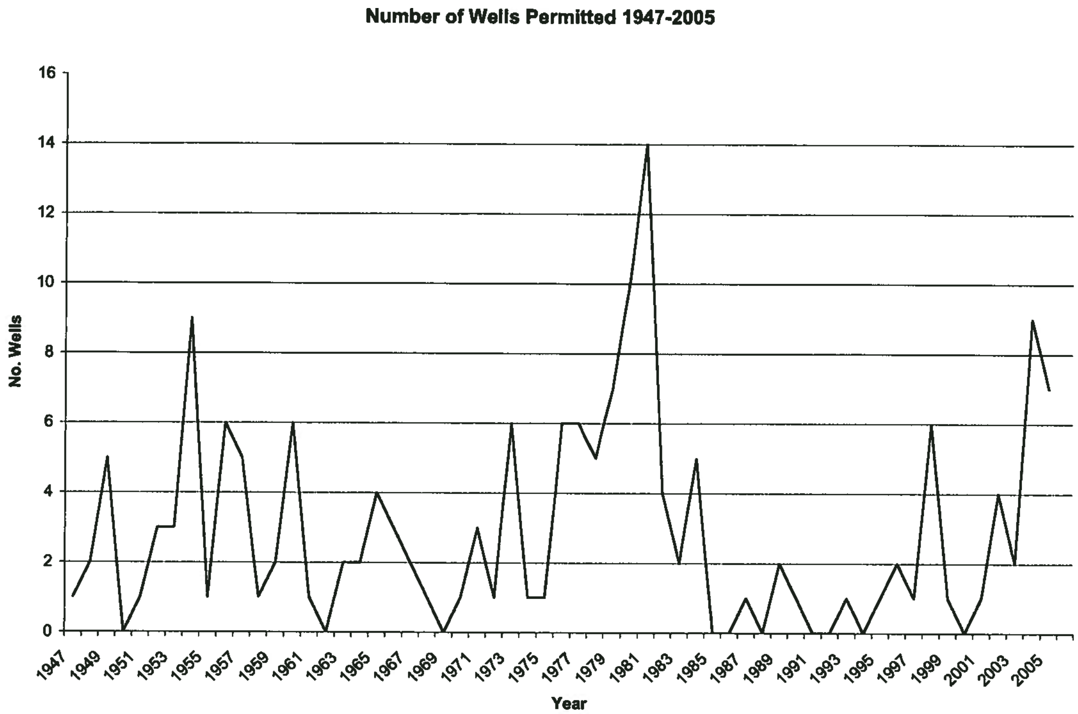


Figure 2. Number of wells permitted each year; 1947-2005. Data are from IHS Energy.

There have been no discoveries inside the FNF and the only discovery in the immediate area is the Covenant Field (2004). This field is in the Wolverine Federal Exploration Unit which extends for 40 miles along the northwestern boundary of the Richfield RD.

PAST AND PRESENT OIL AND GAS DEVELOPMENT ACTIVITY

There is currently one active oil and gas lease within the FNF. Four state oil and gas leases totaling 701.7 acres were transferred to the FNF as a result of the "Utah Schools and Land Exchange Act of 1998" but all but one have since terminated. The remaining lease, now identified as U-78183, includes all of section 32, T. 24 S., R 2 W., 301.7 acres and is held by production in the Wolverine Unit. However, based on the steep slopes and lack of access to this area it is not reasonably foreseeable that it would be occupied for drilling or other facilities. Wolverine has no current plans to drill in this area (personal communications Paul Spiering, Wolverine, 02/06/2007). Most of the BLM lands in the valleys separating the FNF RDs are under lease and it is presumed that the same applies to Private and State of Utah lands. Map 4 shows authorized Federal leases near FNF. Many of the leases on BLM lands are within or near the Sevier Frontal Zone Play (USGS 1907). Map 5 shows townships within the FNF where lands were nominated for oil and gas competitive leas sales during 2005 and 2006. The Wolverine Unit was established in 2003 and the Covenant Oil Field was discovered by the first unit obligation well, the Kings Meadow Ranches 17-1 located in the SENW of section 17, T. 23 S., R. 1 W. Ten additional wells were drilled on the identified structure with nine of them

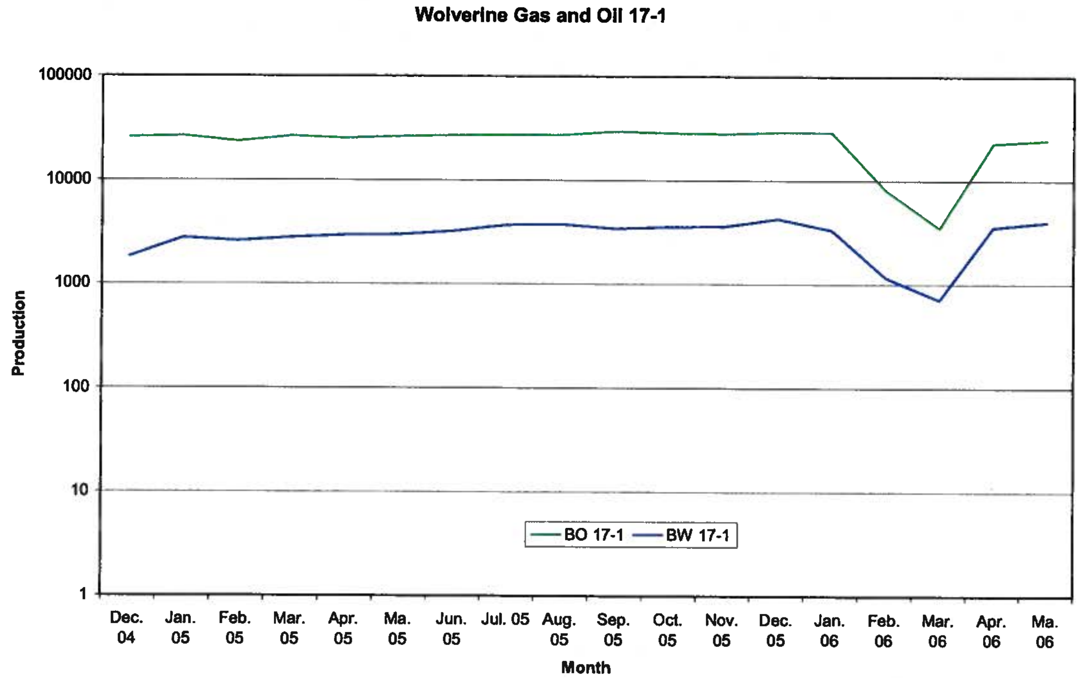


Figure 3. Wolverine Gas and Oil 17-1 well production history from December, 2004 through May, 2006. Production data are from Utah Division of Oil, Gas and Mining.

becoming producers. Participating Areas consisting of 160 acres have been established for each well. The discovery well and the first development well (Covenant 17-2) were vertically drilled whereas the other development wells were all directionally drilled from the two existing pads. All production is from the Navajo Sandstone of Jurassic age and totaled 1,850,232 BO, 0 MCFG and 263,285 BW through May 2006 (Utah Division of Oil, Gas and Mining). Figure 3 shows production history for the Wolverine 17-1 well which indicates no decline in the first 17 months of production except when shut in. Production depths are in the 6,000-6,500 feet range (TVD). None of these wells are on FNF lands but this field is likely representative of any future fields discovered in the Sevier Frontal Zone Play.

OIL AND GAS OCCURRENCE POTENTIAL

A large portion of the FNF is within the boundaries of the BLM Richfield Field Office (RFO) and was included in the RFD developed for that area in 2005 following guidance in BLM IM 2004-089. This RFD included a discussion of the USGS plays discussed above and all other available resource information. Only one of the USGS and UGS plays has produced in the immediate vicinity of the FNF (Covenant Field in USGS Play

1907). Gas production from Cretaceous sandstones and included coal beds (USGS plays 2107 and 2052) has occurred north and east of the forest in Emery and Carbon Counties.

Some of the assessment units in the Mancos/Mowry, Mesaverde and Ferron/Wasatch Plateau TPSs have been prolific producers in the Uinta Basin northeast of the FNF. The Upper Valley Oil Field (USGS Play 2106) on the Dixie National Forest approximately 35 miles south of the FNF has produced over 25 million barrels of oil and small amounts of gas from Kaibab and Moenkopi reservoirs. The South Last Chance Field located 12miles east of the Fremont River RD also tested gas from the Moenkopi but has no production history because it has no pipeline connection (Jackson, 1993). USGS plays 1902 and 2403 are both hypothetical and remain unproductive. Flushing of oil and gas in Paleozoic and Mesozoic reservoirs by carbon dioxide gas has impacted occurrence potential in some areas but the extent of flushing in the various units is not well defined. The Hamilton Brothers 1-1 well (NESW section 1, T.27 S., R.3 E.) encountered significant amounts of carbon dioxide gas in the Kaibab Limestone and lesser amounts in deeper Paleozoic formations and the Shell Oil Company 1-10R Harvey-Federal well (NWNW section 10, T. 32 S., R. 1 E.) tested carbon dioxide gas from the Shinarump. Farther to the east in T.32 S., R. 3 E. three wells drilled by Mid Continent Oil and Gas in the 1980s tested significant amounts of carbon dioxide gas from Permian and Mesozoic reservoirs.

Map 3 shows estimated oil and gas occurrence potential in the FNF and surrounding area using occurrence potential and certainty ratings as defined in Appendix A of this report. The northeastern part of the area is given a high rating for the occurrence of hydrocarbons with a high degree of certainty (H/D) based on known occurrences in the Sevier Frontal Zone Play (Covenant Field) and various Cretaceous plays covering the Wasatch Plateau. The high potential area associated with the Sevier Frontal Zone Play is expanded to the west relative to USGS Play 1907 on the assumption that any structures west of the front could be filled by hydrocarbons migrating from the west. The H/D area includes the northeastern part of the Richfield RD and the eastern part of the Fillmore RD. The southeastern part of the study area is given a high potential for occurrence with a low degree of certainty (H/B) based largely on known occurrences in the Permo-Triassic Unconformity Play (2106) at Upper Valley and Last Chance Fields. The low certainty rating results from the unknown extent of the carbon dioxide gas flushing that has occurred in parts of this and deeper plays. This H/B area includes the eastern part of Fremont River RD. The western part of the study area is given a medium potential for occurrence with a low certainty rating (M/B). The only play covering this area is the hypothetical Basin and Range Late Paleozoic Play (USGS 1902). This play covers a large area of very complex geology and is lightly explored resulting in a low certainty of potential in most areas. The Fillmore and western part of the Beaver RD are included in the area given M/B potential rating. The western Fremont River, western Richfield and eastern Beaver RDs have a low potential for oil and gas occurrence (L/B) but a high potential for the occurrence of carbon dioxide gas with a high certainty because of the Hamilton Brothers, Shell and Midcontinent wells described above.

OIL AND GAS DEVELOPMENT POTENTIAL

The RFD for the Richfield Field Office developed in 2005 included the eastern part of the FNF area and is generally consistent with this RFD in the area of overlap. The entire area of the Sevier Frontal Zone Play (1907) is given a high potential rating for development based on the 2004 discovery of the Covenant Oil Field, developmental drilling results, seismic surveys and leasing activity on BLM, Private and State of Utah lands. A relatively small portion of the FNF is included in this play (Map 2), essentially those portions of the FNF in Sevier County. The northeastern Richfield RD is rated as medium based on the existence of several plays involving source rocks and reservoirs in Cretaceous units and known gas production from these rocks in Emery and Carbon counties. This area is mostly the Wasatch Plateau where topography and lack of infrastructure could discourage development. The remaining portions of FNF are rated as having low potential for development. The only play covering the western part of the area (northern and western Fillmore and Beaver RDs is 1902, the hypothetical Late Paleozoic Basin and Range Play, an area with a complex geologic history which has received little exploration. The southern and western Richfield RD and the Fremont River RD are included in the Permo-Triassic Unconformity Play (2106) and deeper Paleozoic plays but questions regarding source rocks, migration and carbon dioxide flushing have had a dampening effect on exploration and development here. The extreme eastern part of Fremont River RD may be east of the main area of carbon dioxide flushing and is rated as having a high potential for development (Map 6).

RFD BASELINE SCENARIO ASSUMPTIONS AND DISCUSSION

The baseline scenario developed below follows BLM IM 2004-089 and assumes that all potentially productive areas are available for leasing under standard terms and conditions (i.e., lease form without stipulations) except those areas designated as closed to leasing by law, regulation or executive order. It is important to keep this in mind as it represents a major departure from existing conditions. Only an insignificant part of the FNF is currently under lease and past drilling statistics are not reliable indictors of how much activity could be projected under the conditions assumed following IM 2004-089. UGS (2004) indicates a historic drilling rate of 0.65 well/year on the Fishlake National Forest and states that no wells have been drilled in the forest since 1984. When FNF and adjacent BLM, Private and State of Utah lands are considered together the historic rate increases to 3 wells/year (Figure 2). Discovery of the Covenant Field in 2004 increased industry interest in the general area and led to a spate of seismic and leasing activity.

Record oil and natural gas prices in recent years also contributed to the increase in interest.

UGS (2004) projected that 18 exploration wells and 20 development wells (38 total wells) could be drilled in the FNF during the next 15 years or 2.5 wells/year. In a 2005 addendum UGS added 6 wells in the Sevier Frontal Zone Play for a total of 24 total exploration wells and increased the number of development wells from 20 to 31 (55 total wells). This raises the average drilling rate to 3.7 wells/year which is slightly greater than the past rate when all lands are considered.

The RFD for the Richfield Field Office (2005) projected a total of 360 new wells (exploration and development) over the next 15 years on all lands in the Sevier Frontal Zone Play. Most of this play lies outside of the FNF with only a small amount of the western Richfield RD and a somewhat larger part of the northern Beaver and southern Fillmore RD being included. The Richfield Field Office RFD projected 49 new wells on the Wasatch Plateau (Cretaceous plays) but included parts of the Manti-La Sal NF in addition to FNF lands. The southern part of the Wasatch Plateau (the Fishlake NF part) is less prospective than the Manti-La Sal portion as coal gas content and source rock maturity both decrease from north to south (UGS, 2004; USGS, 2003). The Richfield RFD projected 45 wells for the southeastern part of the planning area based largely on plays that do not extend into the FNF.

Drilling history provides little useful information for projecting future activity on FNF lands because of the small number of leases issued in the past. The baseline scenario is based on the assumption that all potentially productive areas can be open for leasing under standard lease terms and conditions, except those areas designated as closed to leasing by law, regulation or executive order. This represents very different conditions than those existing in the FNF where fewer than one well/year have been drilled (UGS, 2004). When adjacent BLM, Private and State lands are considered with the FNF lands, the historical rate increases to almost 3 wells/year. The projected baseline scenario developed here is that an average of three exploration wells/year will be drilled over the next 15 years resulting in a total of 45 wells. Two new fields are projected to be discovered. One field is expected to be similar to the Covenant Field (10 wells) and could include lands outside the FNF boundary where the outside activity would result in cumulative impacts on forest lands. The second field will also likely be an oil field similar to the Upper Valley Field including 20 production wells.

Table 1. Baseline RFD scenario.

Exploration wells	45
Development wells (two fields)	30
Total wells	73
*	

* Two of the exploration wells are projected to be discovery wells and therefore are also counted as development wells.

It should be emphasized again that this hypothetical scenario assumes that all potentially productive lands are available for leasing with standard stipulations and conditions.

SURFACE DISTURBANCE DUE TO OIL AND GAS ACTIVITY ON ALL LANDS

Seismic Exploration

Seismic exploration is a survey method used by geologists and geophysicists to identify possible traps which could contain reservoirs of oil and gas in permeable rock. It is an indirect method because it is used to map the underground rock structure using shock waves, as opposed to drilling which directly tests the composition and permeability of rock and occurrence of oil and gas in these structures.

Several methods of seismic survey can be used. The primary differences between methods involve how the shock wave is induced into the ground and how the survey areas are accessed. The most common and likely to take place on the Forest are the Vibroseis and Drilling/Explosives methods.

<u>Vibroseis</u>

The thumper and vibrator methods pound or vibrate the earth to create the shock wave. Usually four large trucks, each equipped with vibrator pads (about four feet square), are used. The pads are lowered to the ground and vibrators on all trucks are turned on simultaneously. Information is recorded, the trucks are moved forward a short distance, and the process is repeated. Except where an access trail may be constructed or cross-country travel is necessary, surface disturbance is usually minimal since little surface area or disturbance is required to operate the equipment at each test site. On National Forest System lands this method is used on existing roads and trails that can accommodate this activity without damage. Road building is usually not allowed.

<u>Drilling/Explosives</u>

The drilling method uses small portable drills that drill small-diameter holes to depths of 100 to 200 feet. Four to twelve holes are drilled per mile of line. Usually, a 50-pound charge of explosives is placed in the hole, covered, and detonated. The explosion sends energy waves that are reflected back to the surface from subsurface rock layers. The holes are drilled along a line that can be miles in length. In areas accessible by roads or trails truck-mounted drill rigs are used. In rugged topography, inaccessible to wheeled vehicles, a portable drill may be transported by helicopter. In recent years the use of off-road articulated buggies with large balloon tires has increased because they are very light on the land and less expensive to use than helicopters. The typical drilling seismic operation may use 10 to 15 men operating five to seven vehicles. Under normal conditions, three to five miles of line can be surveyed each day using the explosive method. The vehicles used for a drilling program include several heavy truck-mounted drill rigs or buggy-mounted rigs, water trucks, a computer recording truck, and several light pickups for the surveyors, shot-hole crew, geophone crew, permit man, and party chief. Public roads and existing private roads and trails are used for access and staging areas as much as possible. Several trips a day are made along a seismic line. Drilling water, when needed, is usually obtained locally.

On National Forest System lands some of the seismic exploration is done using off-road buggies. The buggies can only be used in fairly flat terrain thus most of the seismic exploration is done using heliportable methods. Small portable drills are transported by helicopter from site to site to drill the "shot holes". The recording equipment and crews are transported by helicopter or on foot from a staging area or landing zone. Generally, the shot holes are shallower than when drilled with truck mounted drills and the size of the explosive charge used is smaller.

In addition to the traditional two dimensional (2-D) surveys, three dimensional (3-D) surveys are often completed in areas where more detailed information is needed to define a suspected or known structure. The 3-D method is similar to the 2-D method but would employ several parallel lines with similar shot-hole spacing in a semi-grid pattern.

Surface disturbance is generally negligible however the human activity along the lines can be intensive for short periods of time while crews are setting geophones, inducing shock waves, and collecting seismic information. Minor vegetation clearing is needed along the lines to set geophones and drill shot-holes. Drill rigs are portable with self-leveling supports. No excavation of drill pads is necessary. However, hand crews often need to remove rocks, logs, and other debris around the drill site. Once completed, drill cuttings, buggy tracks, and other disturbances are raked by hand crews to minimize evidence of activities. Survey markers are removed and any tree limbs and vegetation removed for operations are broken up and spread over the disturbed areas.

For the Sevier Frontal Play extensive seismic exploration was conducted on National Forest System and adjacent BLM and non-Federal lands from about 2003 through 2006. The UGS (2005, p.15) estimates that only about another 25 line miles of survey would be needed to cover the remainder of prospective lands on the Fishlake National Forest. For the other plays, the UGS estimated that approximately 625 line miles of seismic survey would be reasonable to cover the prospective lands. Therefore, the total estimated length of survey lines is 650 miles. Of this the UGS estimated that about half would be accessed using buggy mounted equipment and the other half with helicopter transported equipment. Since the topography on lands administered by the Fishlake National Forest is very rugged and cut by deep drainages, probably less than half would be completed with buggy-mounted equipment. Therefore, the disturbance estimates are probably high but feasible. Surface disturbance was estimated at 1.207 acres per line mile for buggy mounted operations and 0.007 acres per line mile for helicopter operations. The main difference is that buggy operations require buggy travel over the entire line where helicopter operations disturb only the small areas around each drilling or shot-hole location. Surface disturbance is calculated as follows:

Surface Disturbance (buggy operations): 325 miles x 1.207 acres per mile = <u>392.3 acres</u>

Surface Disturbance (helicopter operations): 325 miles x 0.007 acres per mile = <u>2.3 acres</u>

Total Surface Disturbance: 392.3 acres (buggy operations) + 2.3 acres (helicopter operations) = <u>394.6 acres</u>

Inspections of operations by Forest personnel during and after completion of operations, has shown that there is little evidence of surface disturbance shortly after operations are completed (Steve Winslow, Project Inspection Reports for 2004 and 2005, Fishlake National Forest). Net surface disturbance that would remain in following years is considered negligible.

Exploration Drilling

It is estimated that 45 exploration wells would be drilled. Two of these wells would be discovery wells leading to field development. The discovery wells are considered in the next section for field development. An analysis by Forest Service Engineers (Fishlake NF O&G Engineering Report, 2007) was completed to determine the average surface disturbance for exploration pads, new access roads, and reconstruction of existing NFS roads.

<u>Drill Pads</u>

Drill pads vary in size depending on topography, depth of well (rig size), duration of drilling and possibly other factors and are usually between 2.5 and 5 acres in area. Drilling pads in the Uinta Basin are usually between 3.7 and 5 acres, including roads which would be a small part of the disturbance there (McKee, 2006). Pads constructed on NFS lands would probably tend to be larger than those in the Uinta Basin because the factors listed above would all tend toward larger pads. Another factor is the recent trend of using larger drill rigs and employing directional drilling to minimize new road construction in rugged topography or sensitive areas. A drill pad disturbance area of 5.9 acres is assumed here. This estimate assumes the high-end pad dimensions of 425 feet by 350 feet with additional disturbance for topsoil storage, drainage diversions, and vegetation clearing.

Construction of New Roads

New roads would be necessary to access the pads from existing NFS roads and other highways. It is likely that access roads would be longer on NFS lands than on BLM lands because National Forests are often more remote, have more rugged topography and drill sites may be occupied for greater lengths of time requiring more supply storage space. The following parameters were used to calculate the amount of surface disturbance resulting from road construction for each well. A GIS-based analysis was used to determine the average straight line distance of all potential pad locations on the Forest from an existing NFS road or other highway. This average distance was adjusted to account for topography and road grade.

Average adjusted road length	0.75 miles
Width of area disturbed for road	39 feet
Curve widening/turnouts, etc., factor	1.25
Topsoil storage	0.25 acres/mile

Calculations using these figures yield an average disturbance of 6.2 acres per mile of road construction. Related surface disturbance for each well with 0.75 miles of new road would be 4.6 acres.

Reconstruction of Existing National Forest System Roads

Additional disturbance would result from reconstruction of NFS roads to a standard needed to safely accommodate existing traffic, rig mobilization, and other project traffic. The GIS-based analysis was used to determine the average distance of reconstruction. This average distance was increased to meet Forest Service road maintenance objectives for the higher road level.

Average adjusted length	2.59 miles
Width of new disturbance	13 feet
Subtotal road template disturbance	4.09 acres
Additional disturbance for turnouts	0.18 acre
Additional disturbance for curve widening	0.10 acre

Calculations yield an average disturbance of 4.4 acres per well for road reconstruction.

Estimated Surface Disturbance

The projected surface disturbance for each exploration well is summarized below:

Well Pad	5.9 acres
Road Construction	4.6 acres
Road Reconstruction	4.4 acres
Total Disturbance	14.9 acres/well

The total surface disturbance resulting from exploration drilling of 43 exploration wells during the 15 year period is 640.7 acres (45wells – 2 discovery wells) x 14.9 acres/well). If 43 of the 45 wells are dry holes (assuming that the other two are discovery wells), they will be plugged and abandoned and the disturbance would be reclaimed soon after completion. It is assumed that revegetation would meet required standards in approximately 5 years.

Field Development

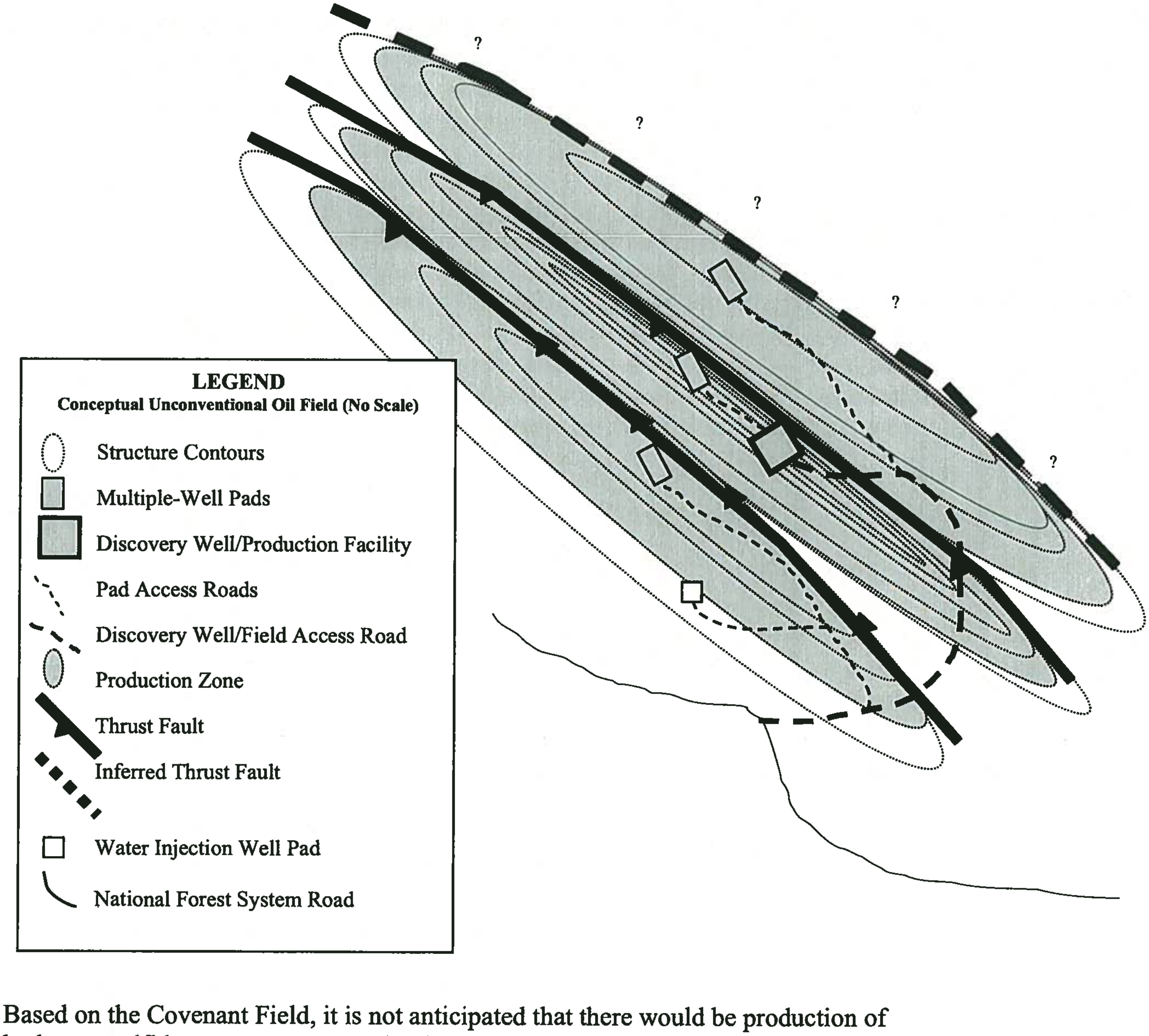
It is projected that two of the 45 exploration wells would make discoveries and lead to two new oil fields that would be developed during the 15 years covered by this RFD. Perhaps the most likely new field would be in the Sevier Frontal Zone Play and consist of 10 production wells. Several of the wells would be drilled from the same pad thus reducing the amount of surface disturbance. The second field could be a conventional oil field similar to the Upper Valley Field but consisting of 20 wells.

<u>Sevier Frontal Zone Play Field</u>

This oil field should be similar to the Covenant Field. Development would most likely involve directional drilling and fewer pads than more conventional fields. It is assumed that the geology and topography would allow for this type of development. Directional drilling would be used to reduce the number of pads and length of new roads. Figure 4 is a conceptual plan view of such a field.

The life of production once full field development has been completed is estimated at 30 years. Overall oil production is estimated at 6,000 to 10,000 barrels per day. Water production and potential enhanced production and water injection are probable at some point during field draw-down. The water disposal well would likely be drilled relatively early in the development process but injection of water for enhanced production would not be necessary for approximately 20 years as the field becomes nearly depleted.

Figure 4. Plan View – Conceptual Sevier Frontal Zone Oil Field (Not to Scale)



Based on the Covenant Field, it is not anticipated that there would be production of hydrogen sulfide to present a potential danger to drillers, field operators, or the public or which would require facilities for containment, monitoring, separation, or disposal.

DISCOVERY/CENTRAL PRODUCTION FACILITES PAD

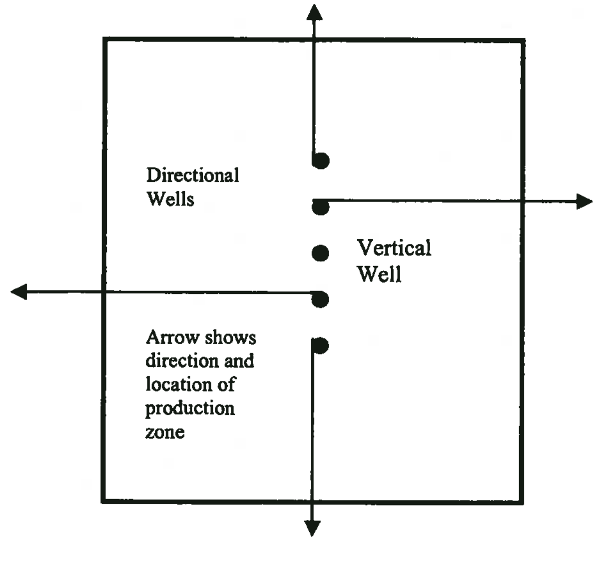
The discovery well pad would be converted to a production well and used as a central production facilities pad. It would be enlarged from the original 5.9-acre disturbed area to a disturbed area of approximately 12 acres to accommodate additional facilities. The cut and fill slopes would be revegetated. The pad access road running surface would stay about the same but the cut and fill slopes would be revegetated. Additional gravel column thickness would probably be required to accommodate all-weather operations for the life of the field. The surface disturbance for this discovery well/central production facilities pad is calculated at:

Discovery/Central Production Facilities Pad: 12.0 - acre pad + 4.6 acres new road + 4.4 acres of road reconstruction = 21.0 acres.

PRODUCTION WELL PADS

Based on development of the Covenant Field, the UGS predicted that two production well pads would be constructed. A third production well pad has since been added to the scenario to account for potential additional development (Figure 4). The pads would be constructed to accommodate the predicted 10 wells, and possibly as many as 15 wells. They would be designed and constructed to accommodate 5 wells each (one vertical and four directional wells). The pads would be the same dimensions as an exploration pad, approximately 350 ft. x 425 ft. approximately based on the size of Production Pad B on BLM lands in the Covenant Field. The pads could contain the wellheads, meters, down-hole submersible pumps, pipeline collectors, water drain/evaporation pit, truck turnaround, and a control building. The pad is large enough to contain other facilities if needed. The Central Production Facility would contain separators and most of the other facilities needed for production. The pads would involve a disturbed area of approximately 5.9 acres, including cut and fill sections and the topsoil stockpile. Initially a vertical well would be drilled. Assuming that this well is successful, four additional wells could be drilled directionally away from the pad in different directions to increase the area of production. One possible configuration of wells on a single pad is shown in Figure 5. The solid dots represent wells on the rectangular working area of a production pad. The arrows show possible directions and production zones for directional wells.

Figure 5. Plan View - Conceptual Multi-Well Production Pad Layout (Not to Scale)



The three additional production pads would share a portion of the original discovery well access road. Based on the well spacing and distance between pads, approximately 1 mile of new access road could be constructed as spur roads for each of the pads.

Total disturbance for the three multi-well production pads is calculated as follows:
Production Pads: (3 pads x 5.9 acres/pad) + (3 miles new road x 6.2 acres/mile) = <u>36.3 acres</u>

ANCILLARY FACILITIES

Ancillary facilities would most likely include an oil pipeline, water pipeline, power transmission line, substation, secondary recovery gas pipeline, water injection well, and pipeline/truck loading facility. Initially crude oil would be trucked to market from the pad locations, most likely a refinery in Utah Valley. At some point, it is likely that a pipeline would be constructed to pipe oil to a truck loading facility possibly located at the intersection of the primary project road and a major Forest or County road. A central production facility at the Covenant Field occupies approximately 29 acres and includes office and shop buildings, facilities for separating the produced oil and water, storage tanks and a "pit" to temporarily store separated water before it is piped to the nearby water disposal well. This facility was constructed on private land owned by the operator and a similar facility on FNF would likely be considerably smaller in area. It is assumed here that the central production facility would likely be about 12 acres as indicated above in the <u>DISCOVERY/CENTRAL PRODUCTION FACILITIES PAD</u> section.

The distance of new pipeline outside of road corridors is estimated at 5 miles with a disturbance of 50 feet. A truck loading pad of approximately 0.5 areas could be needed. Pipeline disturbance is calculated as follows:

> Pipelines: (5,280 ft./mile x 5 miles x 50 ft. width) x 1 acre/43,560 sq. ft. =
> 30.3 acres + 0.5 acre truck loading pad = <u>30.8 acres</u>.

Using the Upper Valley oil field on the Dixie National Forest as a model, it is assumed that a new overhead powerline of approximately 5 miles and occupying 25 acres, and a substation of approximately 0.4 acres, could be needed to provide electric power for the operation.

> Powerlines/Substation: 25 acre corridor + 0.4 acre substation = <u>25.4 acres.</u>

A water injection well is reasonably foreseeable, even though not all fields produce water in high enough quantities to require disposal. Since produced waters usually contain high concentrations of dissolved solids, they are usually re-injected into the zones from which they were produced or into deeper zones with water of equal or higher concentrations of salts. Usually the water is re-injected into the oil producing zone or slightly deeper at some horizontal distance from the producing wells. The water injection well pad would be constructed near the central production facility and have the same dimensions as an exploration pad. It is assumed that the pad would partially share an access road with one of the production pads but would require approximately ½ mile of new road construction. Water pipelines would most likely be partially buried in the project roads or along side the oil pipeline in the same disturbed corridor. Separation of the water from hydrocarbons would take place on individual production pads or the production facilities pad.

The anticipated surface disturbance is calculated as follows:

Water Injection/Disposal Pad: (1 pad x 5.9 acres) + (0.5 mile road x 6.2 acres/mile) = 9.0 acres

ESTIMATED TOTAL SURFACE DISTURBANCE

The total gross and net disturbance area for Sevier Frontal Play Field is calculated at:

21.0 acres - Discovery/Central Production Facilities Pad and Roads
+36.3 acres – Production Pads and Access Roads
+30.8 acres - Pipelines and Truck Loading Area
+25.4 acres – Powerlines and Substation
+ 9.0 acres – Water Disposal Well Pad and Access Road
122.5 acres - Total Gross Surface Disturbance

The total net disturbance area for a Sevier Frontal Zone Play Field is assumed to be the same as the gross surface disturbance. Since the pads could accommodate multiple wells, they would remain approximately the same size or reduced only slightly in size for long-term production even though cut and fill slopes may be flattened and revegetated for long-term stability.

Conventional Oil Field in Other Plays

This conceptual 20-well field is based on a number of small conventional oil fields in Utah which have a single well on each pad (UGS report). Figure 6 displays a plan view of this conceptual conventional oil field.

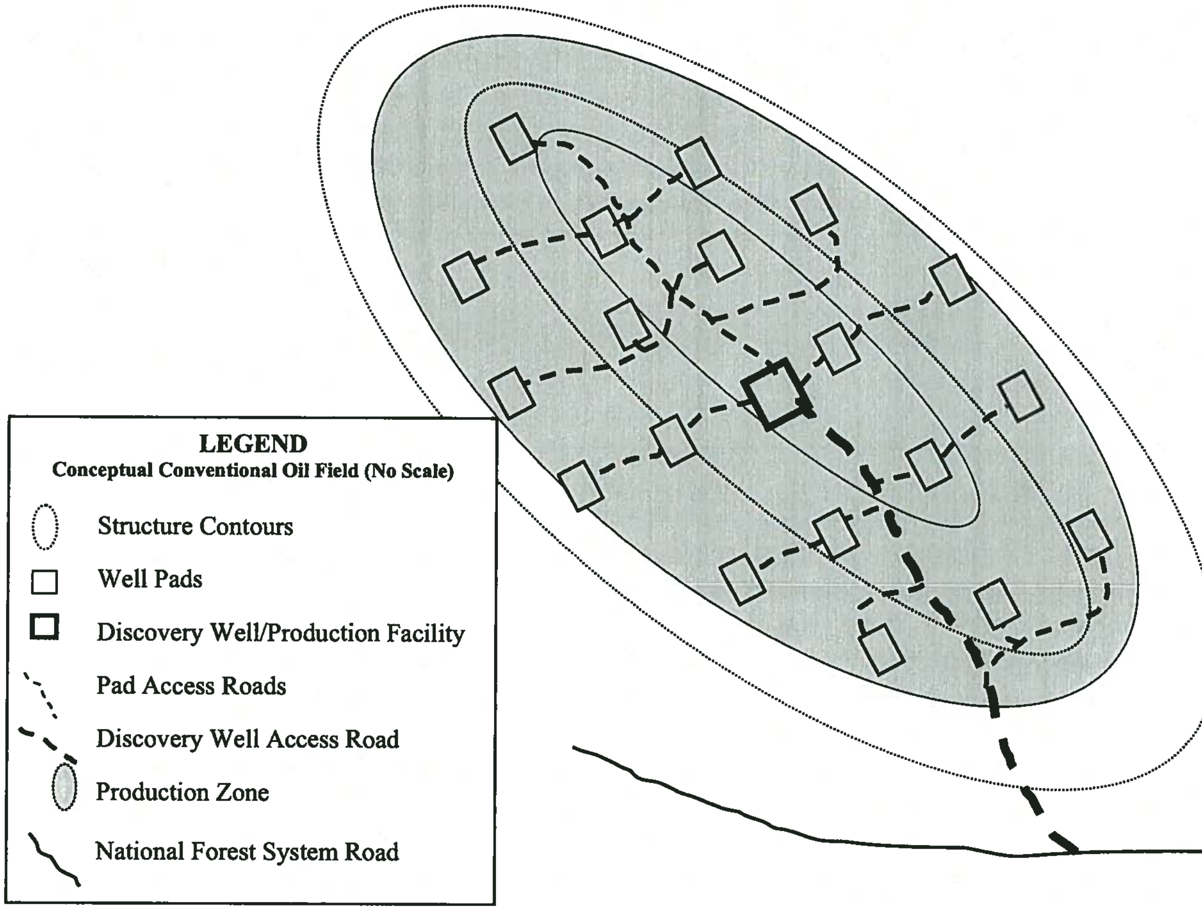
Directional drilling has advantages in that it can be used to decrease the length of new roads and number of pads and can be used to drill production zones where construction of a pad and/or road for vertical wells is not possible. Topography, geologic conditions, and environment issues can prohibit construction of suitable pads. Disadvantages are that directional drilling is more expensive and not always feasible considering underground geologic conditions. Even though directional drilling and production technology is rapidly advancing and industry use of this technology is allowing more multiple-well pads, co-location of wells is not always feasible. Therefore, this scenario is based on conventional oil field developments. Even though this field is based on the assumption that each pad would host only a single well, it is likely that the number of pads and the surface disturbance could be reduced by directional drilling technology and the possibility of drilling more than one well per pad.

The life of production once full field development has been completed is estimated at 30 years. Overall oil production is estimated at 6,000 to 10,000 barrels per day. Water production and injection are probable at some point during late field draw-down after approximately 20 years of production.

Several small oil fields in Utah produce hydrogen sulfide in quantities that require contingencies and production facilities needed to contain and control release into the air. Therefore, it is assumed that this field could also require such facilities. The pads and facilities depicted for this conceptual field could accommodate any facilities needed to contain and control hydrogen-sulfide, therefore no additional surface disturbance has been calculated.

Production of saline water with high total dissolved solids concentrations is also reasonably foreseeable. The most likely scenario is that this water would be disposed of by re-injection back into the rock unit or structure from which it was produced. The purposes would include disposal of the water, protection of other aquifers or surface waters, and increasing underground pressures beneath the oil producing zone, enhancing oil recovery. Since 20 wells are anticipated for this field, it is most likely that one of the marginally producing wells near the fringe of the production zone would be re-entered and converted to a water injection well. No additional pads or surface disturbance is anticipated. Water pipelines would most likely be buried in the project roads or along side the oil pipeline. Separation of the water from hydrocarbons would take place on individual production pads or the central production facilities pad. The estimated pad sizes are sufficient to accommodate these facilities.

Figure 6. Plan View - Conceptual Conventional Oil Field (Not to Scale)



DISCOVERY/CENTRAL PRODUCTION FACILITIES PAD

The discovery well pad would be converted to a production well and used as a central production facility. It would be enlarged from the original 5.9-acre disturbed area to a total disturbed area of 12 acres. The cut and fill slopes would be revegetated.

The new access road for the discovery well would be the same as for an exploration well, since it would have been originally located and drilled as an exploration well. New road access would be 0.75 miles. The well would require 2.59 miles of reconstruction of an existing National Forest System road. After the discovery well is converted to production, the access road would stay about the same but the cut and fill slopes would be revegetated. Additional gravel surface depth would probably be required to accommodate all-weather operations for the life of the field.

Surface disturbance for this facility is calculated as:

Discovery/Central Production Facilities Pad: 12.0 - acre pad + 4.6 acres new road + 4.4 acres of road reconstruction = <u>21.0 acres</u>

PRODUCTION WELL PADS

Approximately 19 additional production well pads would be constructed. One vertical or directionally-drilled well would be located on each pad. Actual pad locations would be affected by topographic or environmental features. Some pad locations could be offset, using direction drilling to reach the intended production zone. The original pads would be constructed to accommodate the drilling operation similar to exploration wells. The pads would disturb an area of approximately 5.9 acres each. For production operations, the working area would be reduced to approximately 4.0 acres or less. Production facilities on each pad would include the wellhead, pump jack, tanks, separators, water drain/evaporation pit, pipeline collectors, meters, truck turnaround, etc.

The Utah State spacing requirement for oil wells is 160 acres. This means that wells would be spaced approximately ½ mile apart, depending on topography. Assuming approximately ½ mile of new road per well, the total length of new roads would be 9.5 miles. Applying a curve factor of 1.25, the total length of new road for developing the new pads would be 11.9 miles.

Surface disturbance for the additional wells and facilities is calculated at:

Production Wells Gross Disturbance: (19 pads x 5.9 acres/pad) + (11.9 miles new road x 6.2 acres per mile) = <u>185.9 acres</u>

Production Wells Net Disturbance: (19 pads x 4.0 acres/pad) + (11.9 miles new road x 6.2 acres per mile) = <u>149.8 acres</u>

ANCILLARY FACILITIES

Ancillary facilities would most likely include an oil pipeline, water pipeline, power transmission line, substation, secondary recovery gas pipeline, water injection well, and pipeline/truck loading facility.

It is most likely that one of the marginally producing wells near the fringe of the production zone would be re-entered and converted to a water injection well. No additional pads or surface disturbance is anticipated.

Pipelines and powerlines would be buried in the access roads but, at some locations, would require additional surface disturbance for placement or burial adjacent to the road or to avoid sensitive areas.

The distance of new pipeline outside of road surfaces is estimated at 5 miles with a disturbance of 50 feet. Oil would most likely be piped to an intersection with an improved road where it could be loaded into trucks for transport to market. A truck loading pad of approximately 0.5 areas could be needed.

This new disturbance is therefore calculated at:

Pipelines: (5,280 ft./mile x 5 miles x 50 ft. width) x 1 acre/43,560 sq. ft. = 30.3 acres + 0.5 acre truck loading pad = 30.8 acres

Using the Upper Valley oil field on the Dixie National Forest as a model, it is assumed that a new overhead powerline of approximately 5 miles and occupying 25 acres, and a substation of approximately 0.4 acres, could be needed to provide electric power for the operation.

Powerlines/Substation: 25 acre corridor + 0.4 acre substation = 25.4 acres.

ESTIMATED TOTAL SURFACE DISTURBANCE

Total gross disturbance for the field is calculated at:

21.0 acres - Discovery/Central Production Facilities Pad and Roads
+185.9 acres - Production Wells and Access Roads
+ 30.8 acres – Pipelines/Truck Loading Area
+ 25.4 acres – Powerlines/Substation
263.1 acres - Total Disturbance

Total net disturbance for the field is calculated at:

21.0 acres - Discovery/Central Production Facilities Pad and Roads
+149.8 acres - Production Wells and Access Roads
+ 30.8 acres - Pipelines/Powerlines
+ 25.4 acres – Powerlines/Substation
227.0 acres - Total Disturbance

Total Estimated Surface Disturbance

Gross disturbance is the total of all disturbance regardless of the duration. The total estimated gross surface disturbance is displayed below by facility:

Seismic Exploration	394.6 acres
Exploration Wells	640.7 acres
Sevier Frontal Play Oil Field	122.5 acres

Conventional Oil Field	263.1 acres
Total Disturbance	1,420.9 acres

Total net or long-term surface disturbance after reclamation would be less than the total gross surface disturbance.

Surface disturbance for seismic lines is temporary, usually lasting only during the field season that operations occur. Operations are conducted by overland travel by rubber-tired vehicles or by helicopter and no road construction occurs.

The 43 exploration well pads and roads (inherently non-productive) would be plugged, abandoned, and reclaimed soon after drilling and revegetated, usually within 5 years.

Production pads and the water disposal well pads for the Conventional Oil Field would be partially reclaimed to a smaller area needed for production and workover (periodic cleaning of the bore with drill rigs) operations. The production pad disturbance area would be reduced from the original 5.9 acres to approximately 4.0 acres.

The total estimated net surface disturbance is displayed below:

Sevier Frontal Zone Play Oil Field	122.5 acres
Conventional Oil Field	227.0 acres
Total Net Disturbance-Production facilities	349.5 acres

At the end of the 15-year analysis period it is assumed that the total area of unreclaimed and residual (not yet determined to meet reclamation standards) surface disturbance would be 349.5 acres associated with production facilities plus the residual disturbance of 223.5 acres (15 wells x 14.9 acres/well) remaining from exploration wells drilled during the final five years, for a total of 573.0 acres.

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APPENDIX A

Mineral Occurrence Potential Classification System

This report uses the mineral occurrence potential classification system found in BLM Manual 3031, *Energy and Mineral Resource Assessment.* The dual system uses a potential rating and a level of certainty rating as defined below.

Level of Potential:

0. The geologic environment, the inferred geologic processes and the lack of mineral occurrences do not indicate potential for accumulation of mineral resources.

L. The geologic environment and inferred geologic processes indicate low potential for accumulation of mineral resources.

M. The geologic environment, the inferred geologic processes and the reported mineral occurrences or valid geochemical/geophysical anomaly indicate moderate potential for accumulation of mineral resources.

H. The geologic environment, the inferred geologic processes, the reported mineral occurrences and/or valid geochemical/geophysical anomaly and the known mines or deposits indicate high potential for accumulation of mineral resources. The "known mines and deposits" do not have to be within the area being classified, but have to be within the same type of geologic environment.

ND. Mineral(s) potential not determined due to lack of useful data. This notation does not require a level of certainty qualifier.

Level of Certainty:

A. The available data are insufficient insufficient and/or cannot be considered as direct or indirect evidence to support or refute the possible existence of mineral resources in the respective area.

B. The available data provide indirect evidence to support or refute the possible existence of mineral resources.

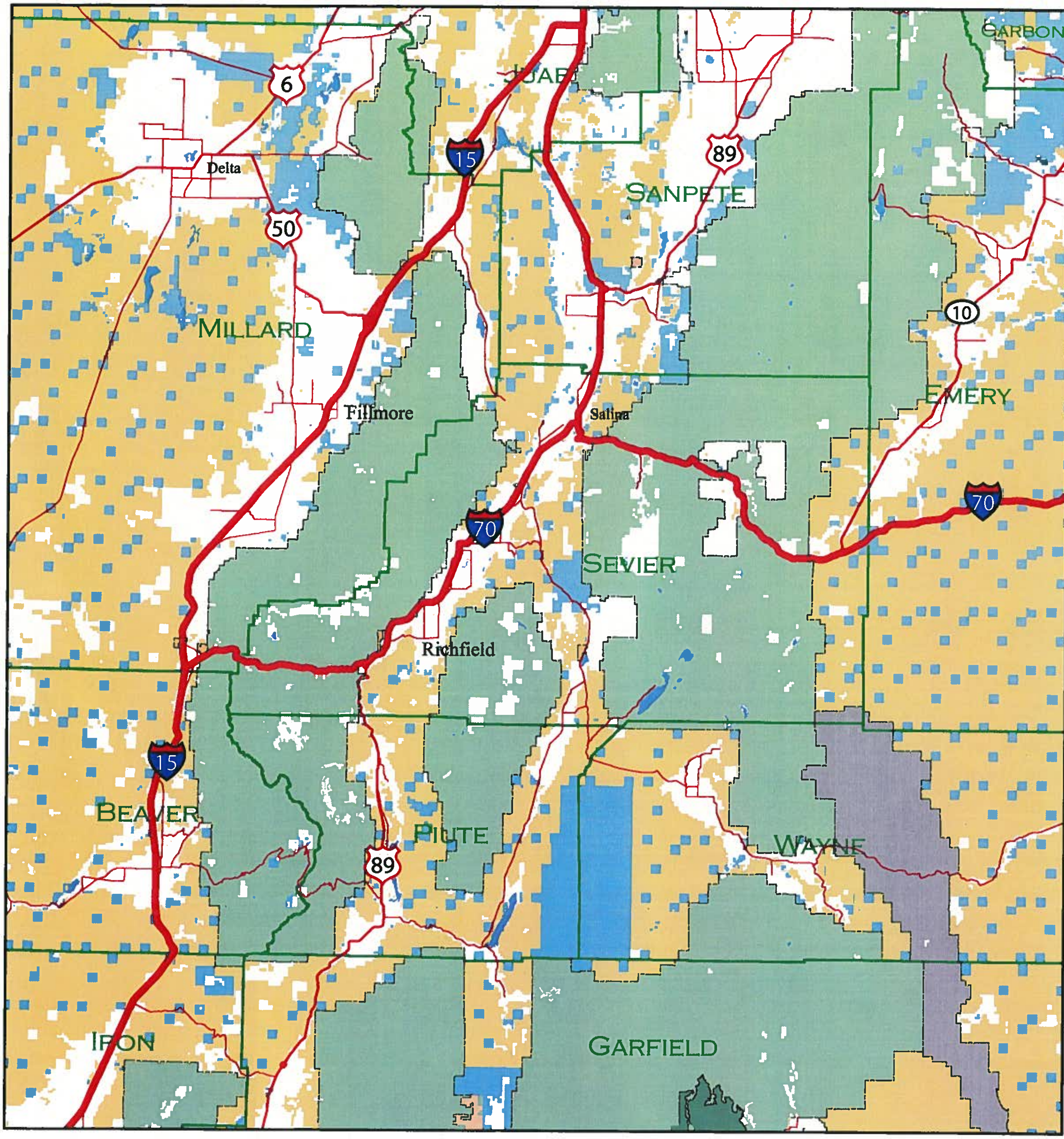
C. The available data provide direct evidence but are quantitatively minimal to support or refute the possible existence of mineral resources.

D. The available data provide abundant direct and indirect evidence to support or refute the possible existence of mineral resources

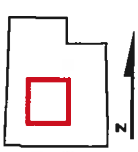
MAPS

Land Ownership

October 19, 2006



Map - 1



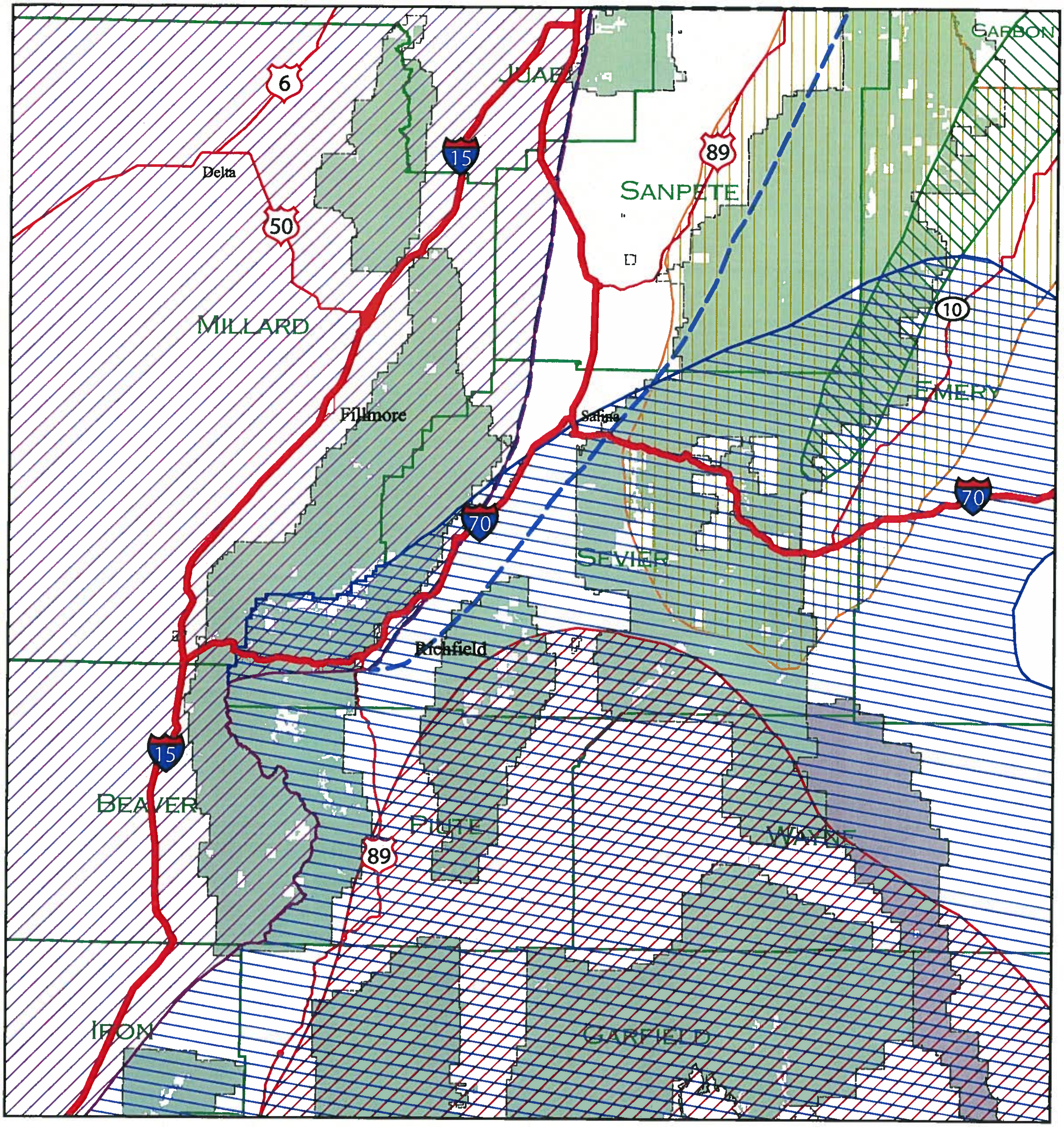
0 2 4 8 Miles

0 2 4 8 Kilometers

Public Land	National Park
State Land	National Forest
Private Land	National Forest Wilderness

U.S. Geological Survey Oil and Gas Plays (1995)

October 19, 2006



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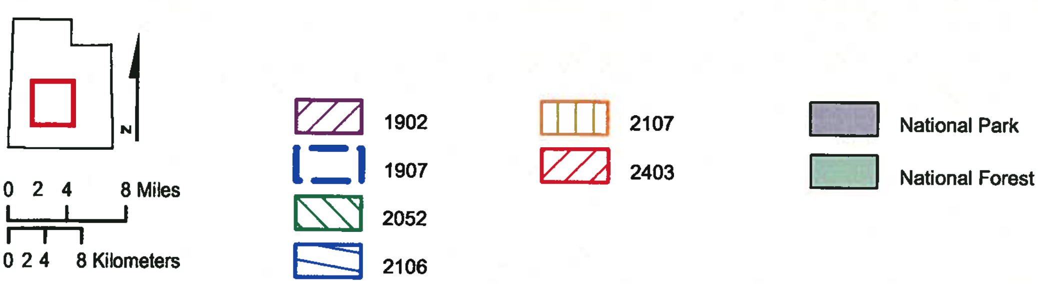

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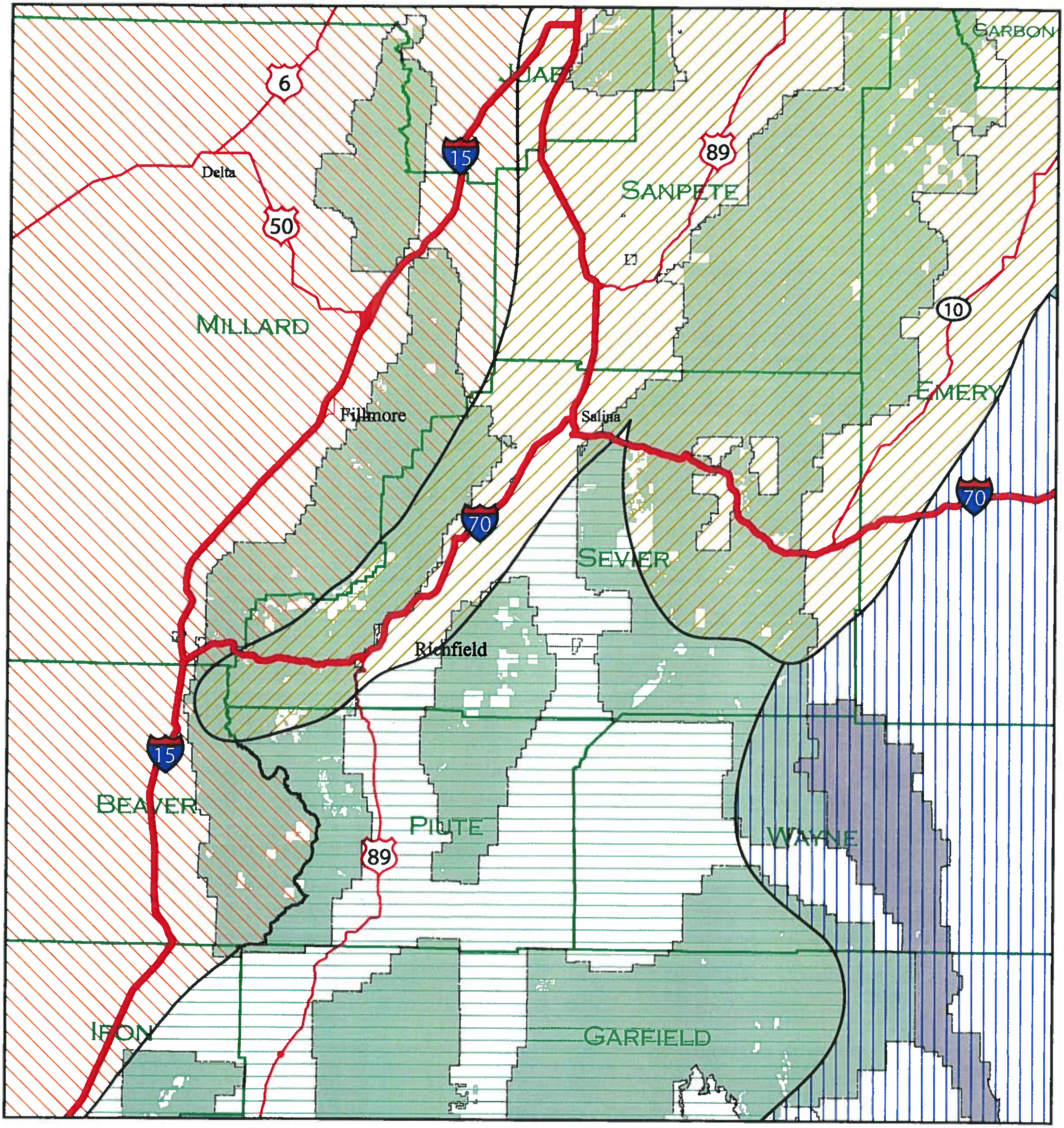
Oil and Gas Occurrence Potential

October 19, 2006



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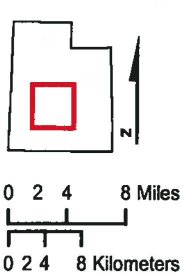

- Low Potential / Low Certainty
- High Potential / High Certainty
- High Potential / Low Certainty
- Moderate Potential / Low Certainty
- National Park
- National Forest

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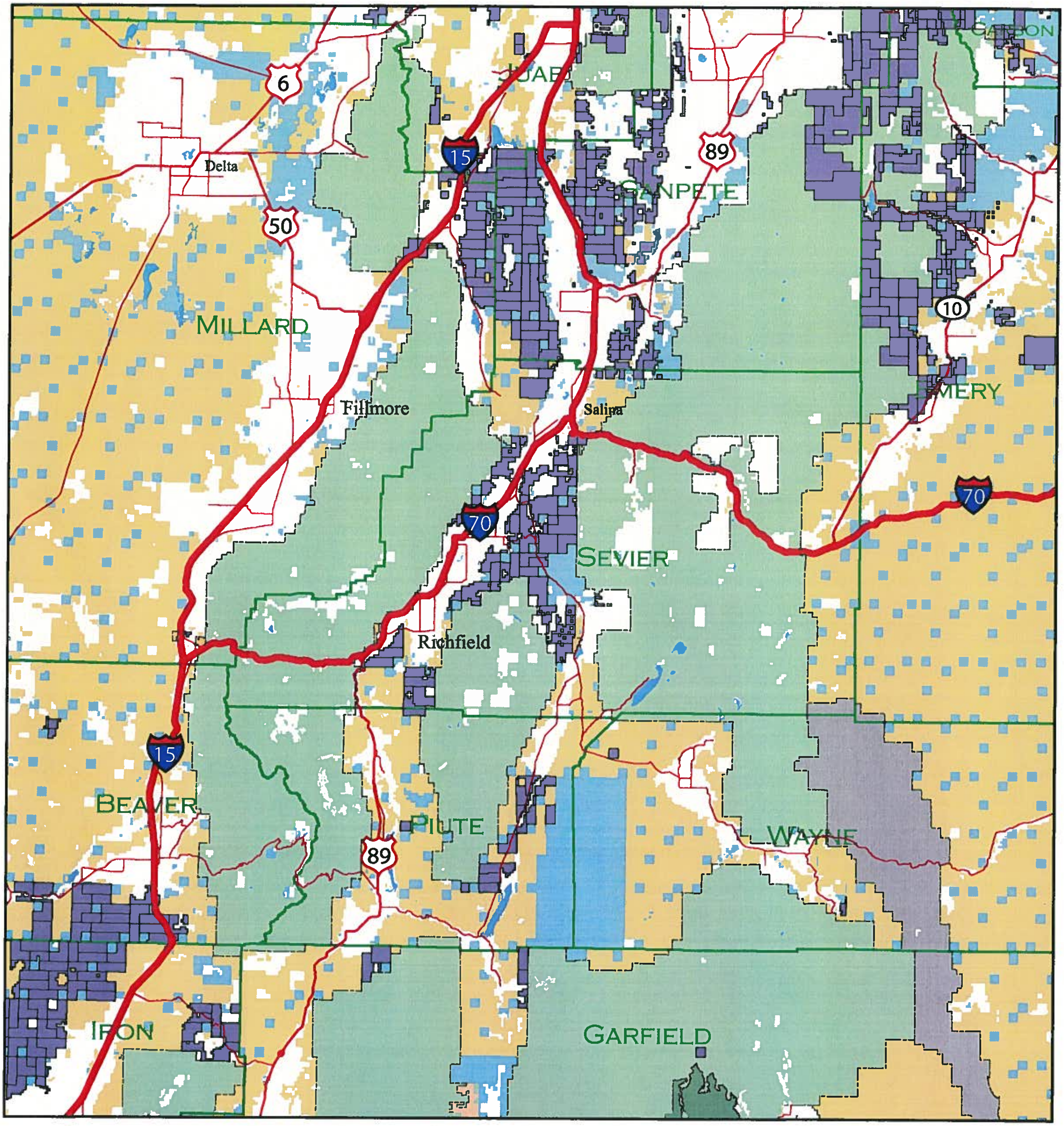
Authorized Oil and Gas Leases

October 26, 2006



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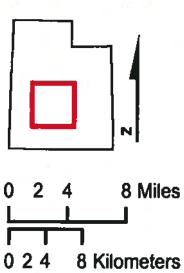

Public Land	National Park
State Land	National Forest
Private Land	National Forest Wilderness
Authorized Oil and Gas Leases	

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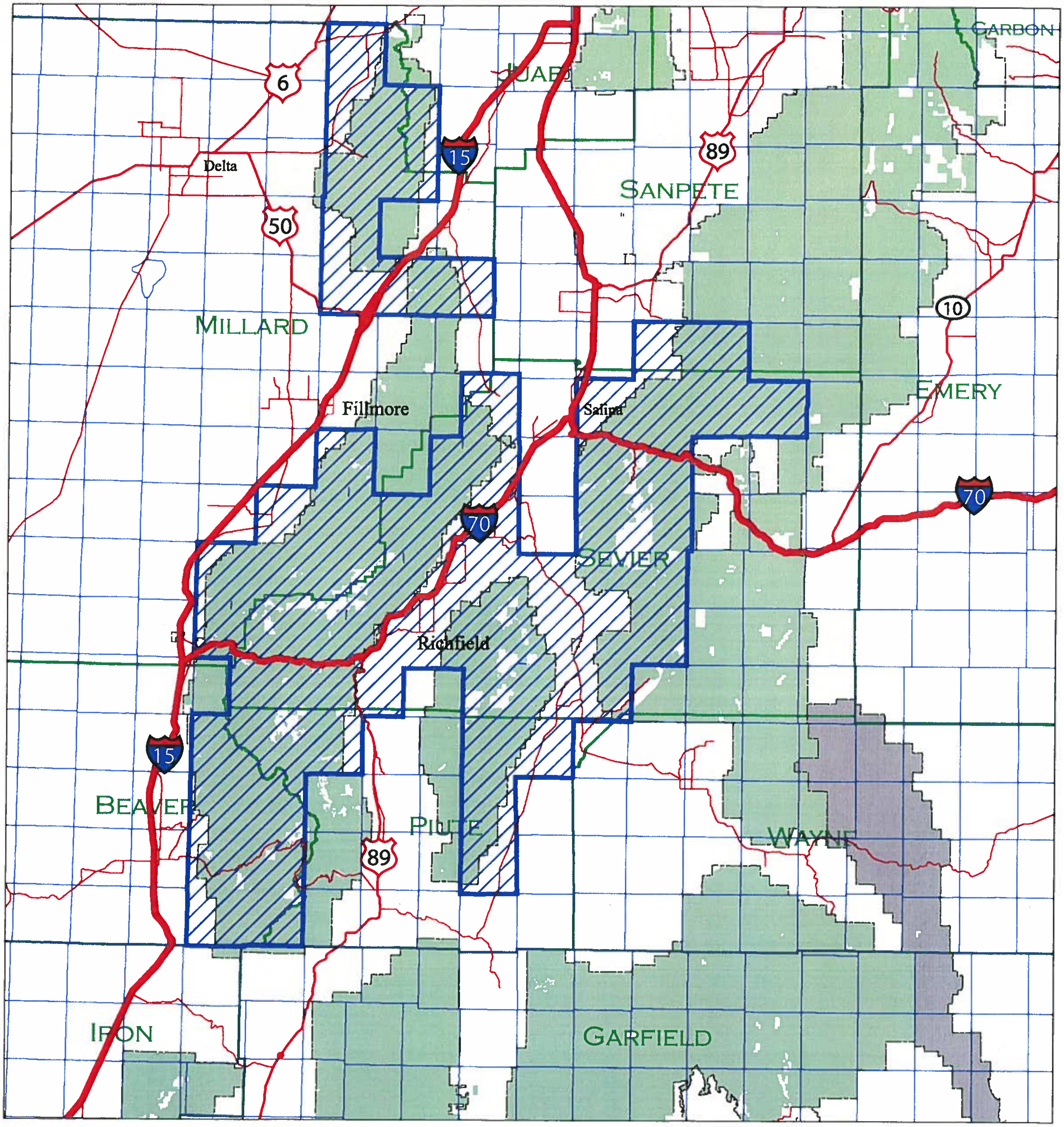
FNF Lands Nominated for Oil & Gas Lease Sales 2005 - 2006

October 19, 2006



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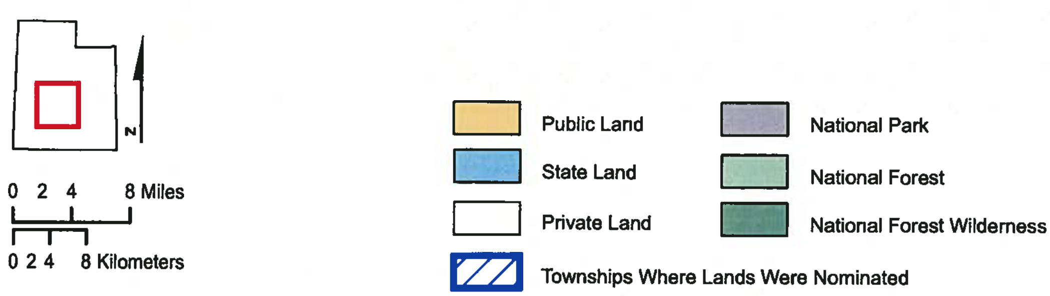

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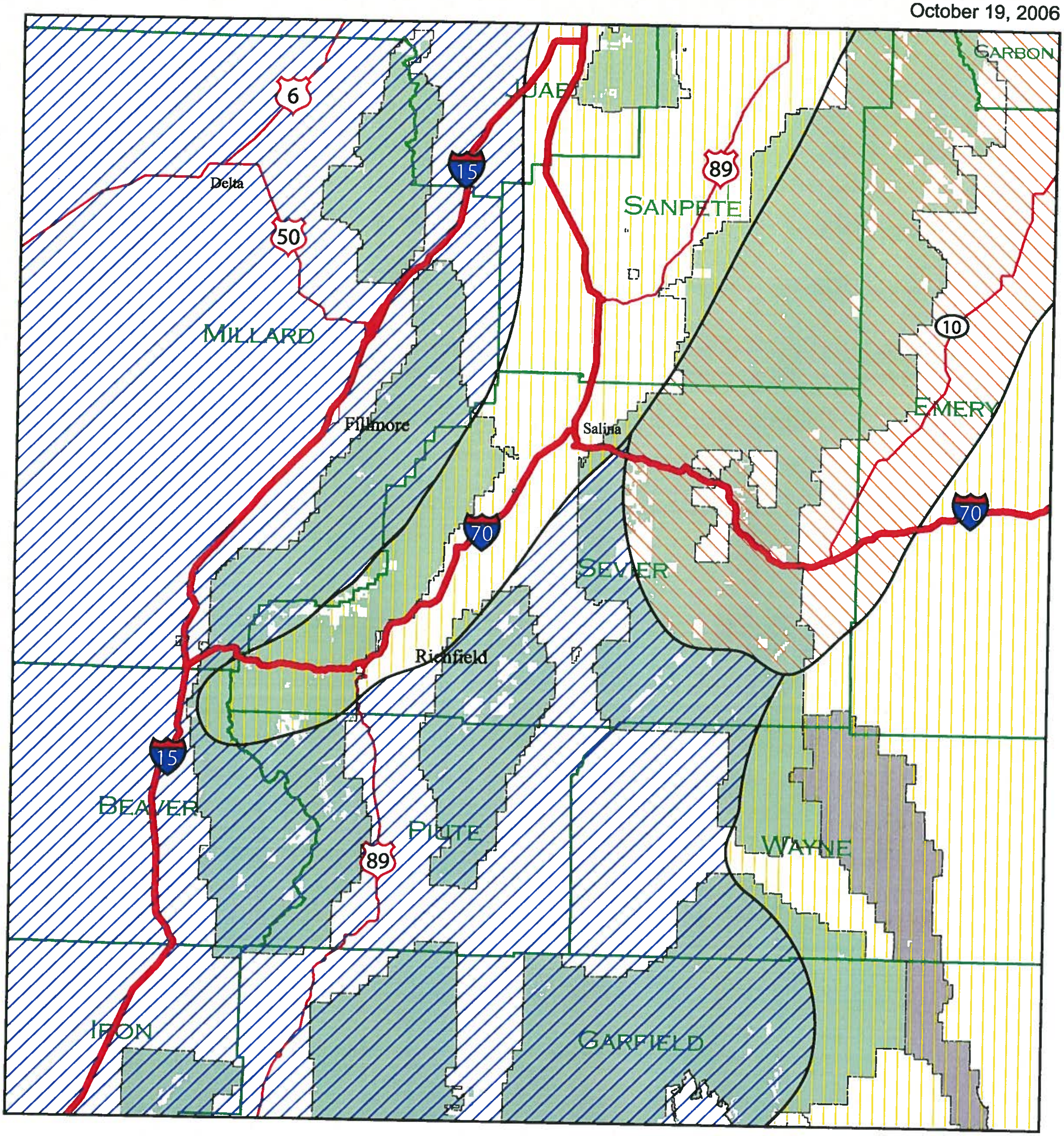
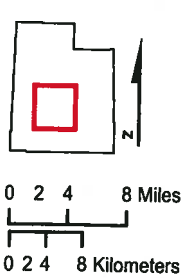
Oil and Gas Development Potential

October 19, 2006



Map - 6



High Potential

Moderate Potential

Low Potential

National Park

National Forest

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Supplemental Reasonably Foreseeable Development Scenario for the Fishlake National Forest Oil and Gas Leasing EIS
April 22, 2011

A reasonably foreseeable development scenario (RFDS) for oil and gas activity in the Fishlake National Forest was prepared in 2007 to be used in an oil and gas leasing Environmental Impact Statement (EIS). The EIS has not been completed and four years have elapsed since preparing the RFDS. This equates to almost one-third of the time period covered by the RFDS (15 years), and it seems appropriate to review and possibly update that document. More specifically, this review will clarify the time period covered by the RFDS, summarize oil and gas activity near the Forest since preparation of the original RFDS and project future activity. As before, this baseline RFDS will be based on the assumption that all potentially productive areas are open for leasing under standard terms and conditions, except those areas designated as closed to leasing by law, regulation or executive order. In practice, not all areas in the Forest will be open for leasing under standard terms and conditions due to restrictions and stipulations developed in the EIS.

Geological relationships within the Forest and their influence on oil and gas occurrence and development potential were discussed in some detail in the original RFDS and need not be revised here. Maps 3 and 6 were developed from the geological data and display oil and gas occurrence and development potential respectively. No United States Geological Survey (USGS) oil and gas assessments or other studies have been conducted that would change the potential ratings depicted by the maps.

The original RFDS was prepared shortly after discovery of the Covenant Oil Field in 2004 when development drilling was beginning. As of the first of April, 2011, 21 wells had been completed in the field and drilling was in progress on two other wells (Utah Division of Oil, Gas and Mining). One new application for permit to drill (APD) is pending. Total production for the field through November, 2010, was 12,497,655 barrels of oil and 6,978,704 barrels of water. No gas was produced.

Exploration activity continued within and around the Wolverine Unit Area along with development of the Covenant Field. Several seismic surveys were carried out and 21 exploration/discovery wells were drilled in the general area resulting in the discovery of the Providence Field approximately 20 miles north of the Covenant Field. An exploratory well, turned discovery, along with a development well have been completed in the Providence Field, with cumulative production from the two wells through November, 2010, totaling 50,579 barrels of oil, 377,264 thousand cubic feet of gas and 16,137 barrels of water. A large percentage of the gas is carbon dioxide and small amounts of hydrogen sulfide are also present (BLM Files, 2011). Several operators other than Wolverine Gas and Oil have drilled exploration wells during the past few years, but those wells, as well as some of Wolverine's wells, have been plugged and abandoned.

The 2007 RFDS projected that 45 exploration wells would be drilled in the following 15 years (3 per year) with two new field discoveries. One of the new fields was predicted to be located in the Sevier Frontal Zone Play and the other was expected to be a smaller version of the Upper Valley Field in the Dixie National Forest and located in the Permo-Triassic Unconformity Play. In the nearly 4 years since the RFDS was completed, 21 exploration wells were completed, which is equivalent to 5 wells each year, resulting in one new field. During this 4-year period, exploration drilling progressed more rapidly than projected, but all the wells were plugged and abandoned except one which may cause the rate of drilling to slow. It also remains to be seen if the Providence discovery will become a viable oil field. Current testing of the two wells indicates that oil production rates decline fairly rapidly and a significant percentage of the produced gas is inert, largely carbon dioxide.

During the four years since the RFDS was completed, exploration drilling has proceeded at a more rapid rate than projected (5 wells per year versus 3 wells per year), with one of the predicted fields being discovered. On the other hand, there have been no new discoveries comparable to the Covenant Field. With this mixed success in mind, it is likely that drilling rates will decrease to the lower rate projected in the 2007 RFDS during the **15 years following final approval of the leasing EIS**. Therefore, 45 exploration wells are projected for this time period resulting in 670 acres of surface disturbance (see 2007 RFDS).

Although exploration drilling in the Sevier Frontal Zone Play has been somewhat disappointing during the past four years, opportunities for continued exploration still exist and it is likely that another field will be discovered in the play in the future. Surface disturbance resulting from the development of this field is estimated to be 122 acres (see 2007 RFDS). A second field discovery, probably in the Permo-Triassic Unconformity Play, still remains a possibility and would disturb 263 gross acres which could be reduced to 227 net acres with interim reclamation after the field is fully developed.

Surface disturbance would be the same as in the 2007 RFDS and is summarized below:

Geophysical Exploration	395 acres
Exploration Drilling (45 wells*)	640 acres
Development Drilling (30 wells*)	385 acres
Total	1420 acres

*Two of the 45 exploration wells will be discovery wells and thus become production wells.

At the end of the 15 year period, approximately 350 acres will remain disturbed in the two producing fields and most, if not all, of the other disturbance will have been reclaimed.

APPENDIX D – AIR QUALITY MODELING REPORT AND SIRS

Appendix SIR-1

Modeling Report

Dixie and Fishlake National Forests

Oil & Gas Leasing Environmental Impact Statements
Air Quality Modeling Report

Prepared for:
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Abbreviations

AP-42	US EPA Guidance document on air pollution emission factors
AQRV	Air Quality Related Value (as defined in FLAG guidance)
b_{ext}	Beta extinction; a measure of the propensity for air to scatter light
EIS	US Environmental Impact Statement
EPA	United States Environmental Protection Agency
FLAG	Federal Land Managers' Air Group
FLM	Federal Land Manager
ISCST3	US EPA Industrial Source Complex air quality model, version 3
IWAQM	Interagency Workgroup on Air Quality Models
lbs/hr	Pounds per hour
MMbtu	Million British Thermal Units (btu); units of heat measurement
Mscf	Million standard cubic feet; measurement unit for gas volume
NOx	Oxides of nitrogen
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NF	National Forest
NWS	National Weather Service
O&G	Oil and Gas
$PM_{2.5}$	Particulate matter less than 2.5 microns in diameter
PM_{10}	Particulate matter less than 10 microns in diameter
ROI	Radius of Impact
SO_2	Sulfur dioxide
UDAQ	Utah Division of Air Quality
UDEQ	Utah Department of Environmental Quality
$\mu g/m^3$	Micrograms per meter cubed
USGS	United States Geological Survey
USFS	United States Forest Service
VOCs	Volatile Organic Compounds
WRAP	Western Regional Air Partnership

1.0 PURPOSE

This modeling report describes an air quality modeling analysis prepared in support of Oil & Gas (O&G) Leasing Environmental Impact Statements (EIS) for the Dixie and Fishlake National Forests (NF). The report uses emission factors required for newer tiered engines as recommended by the U.S. Environmental Protection Agency (EPA) and was performed in a manner consistent with a Modeling Protocol reviewed and commented upon by federal and State of Utah representatives A screening methodology to quickly estimate potential impacts of O&G development emissions at the leasing/exploration stage was prepared and its conservatism verified. This screening methodology will help Forest Service staff in their planning by identifying whether impacts from potential future development scenarios will safely be below impact thresholds, or if further analysis will be required before air quality impacts can be shown to be within acceptable ranges.

The analyses described in this report will support the EIS process by preparing a simple screening tool that land managers may use to estimate air quality impacts associated with potential development. The analyses are based upon conservative estimates of emissions from potential Oil & Gas activity and the atmospheric dispersion of those emissions. As a result of this conservatism, projects shown by this screening method to have impacts within acceptable ranges would clearly meet air quality impact limits in a site specific impact analysis. For all other potential future development of O&G activities identified in the leasing EISs, project specific air quality analyses would be required using appropriate project and site specific information in order to more closely identify potential impacts. While the screening method provides a efficient tool for land managers making leasing decisions it does not represent a full regulatory air quality impact analyses that may be required to permit future, individual O&G activities under existing state and federal air quality regulations.

The modeling analyses described in this report will not address two air quality issues: ozone and secondary particulate formation. Ozone and secondary particulates are pollutants that are not emitted directly but formed through atmospheric processes and the emissions of precursors. Although these issues are a regional concern, an assessment of their impact is beyond the scope of an analysis at the leasing/exploration stage. UDAQ and the Utah Governor's Office recommend a region-wide cooperative approach would be more appropriate to assess impact risks associated with secondary pollutant precursor emissions, which include sulfates, nitrates, and volatile organic compounds (VOCs).

2.0 BACKGROUND / OVERVIEW

2.1 Oil & Gas Leasing Activity

The Dixie and Fishlake NFs are evaluating O&G leasing across their domains in EISs under development. The proposed actions and alternatives in these EISs will be structured to conservatively evaluate potential impacts from a range of O&G activities the United States Forest Service (USFS) considers reasonably foreseeable, and not any project specific development. The EIS for each forest will provide specific definitions of proposed actions and/or alternatives. The analyses in this modeling report will support the EIS reviews of potential air quality impacts and provide a method of estimating the potential impact of any potential exploration or subsequent development scenario. If the conservative analyses in this modeling report clearly document impacts within acceptable ranges set by air quality regulations, Federal Land Manager's Air Group (FLAG) guidance, or a leasing EIS, then additional modeling or impact assessments may not be needed. If a future development scenario is proposed which cannot be shown by the screening tables to meet those acceptable impact thresholds, then the proposed development could not be justified by these screening analyses. Instead, any such development would require a follow-up NEPA analysis and refined air quality analyses that would include project and site specific information in order to further identify potential impacts.

2.2 Initial Screening Model Analysis

The initial aspect of the dispersion modeling analyses described here was to prepare a representative screening analysis that can be used by the USFS personnel to quantifiably estimate potential impacts of O&G exploration planning and leasing. The potential emissions associated with Oil & Gas exploration and possibly subsequent development of those resources are conservatively estimated. The dispersion of those emissions is also conservatively estimated using worst-case meteorological data. The result is a screening analysis that shows maximum potential impacts associated with a given level of Oil & Gas activity. The maximum potential impact estimates from the screening analyses can be compared to benchmark ambient air standards, increments, and thresholds in order to determine if the conservative screening analyses shows that the action being considered meets state and federal impact limits. Because the screening analysis is based upon conservative assumptions, a site specific analysis of impacts associated with a specific proposal could show lower impacts than those conservatively estimated in the screening analyses presented here.

The results of these analyses are normalized sets of conversion factors in tables for various source / receptor elevation differences at 22 graduated source / receptor distances. The tables indicate the predicted impacts in $\mu g/m^3$ for each 1 lb/hr of emissions. The details of the conversion factor tables were described in the modeling protocol for this project after refinement with USFS Air Program Manager, Bud Rolofson. The screening values can be applied to subsequent O&G development scenarios by estimating the air emissions (in lbs/hr) anticipated from those scenarios and multiplying them by the table screening values to determine a screening estimate of potential ambient air quality impacts. Those impacts can be compared against applicable air quality standards, increments, and thresholds to provide an initial estimate of a range of management options based upon air quality impacts. Ambient air potential impact information will allow land managers to estimate the potential for air quality impacts for subsequent levels of O&G development projects.

2.3 Three Oil & Gas Development Scenarios for Evaluation of Initial Screening Table

After initial development of the screening model runs, the reasonableness of the screening tables were confirmed with site specific analyses of USFS identified potential development scenarios to ensure their reasonableness for development scenarios consistent with forest service (FS) expectations. The three potential development scenarios recommended to be considered are:

1. Scenario 1 -- Individual exploratory wells: over the next 15 years, 60 wells are estimated on the Dixie NF and 45 wells on the Fishlake NF. Each scenario spans a period of three weeks for construction, three months of drilling activity, and two weeks of reclamation,

2. Scenario 2 -- A conventional 20-well oil field development featuring 20 well pads and associated oil extraction and processing operations over an area estimated at 3.5 square miles, and
3. Scenario 3 -- A 10 to 15-well directional drilling development (primarily on the Fishlake NF) which features two to three well pads

The USFS notes that primary energy development is expected to be for crude oil, however, natural gas could likely be found as well. The USFS has surmised gas will not be found in volumes that would support commercial development. Gas might be flared onsite or produced in quantities to either fuel onsite engines or support limited development, storage, and transport via trucks.

Air quality modeling was performed for each of these development scenarios to assess potential criteria air quality pollutant (PM_{10}, NO_x, and SO_2) concentrations and air quality related values (AQRV) as defined in FLAG guidance. That information was used to confirm the representativeness, conservatism, and accuracy of the screening modeling analyses. Those specific development scenario model analyses confirmed the conservative nature of the screening runs by showing that predicted air quality impacts from actual development scenarios were lower than the conservative estimates from the screening tables prepared in this analysis. Therefore, impact estimates from the screening tables can be considered as conservative estimates based upon that level of activity as long as the activity occurs consistent with the assumptions included in the screening analyses. The EIS plans to ensure that consistency and/or require a project specific analysis for any development it supports. The screening table impact estimates are conservative (likely to overestimate actual impacts). Therefore, activities whose impacts estimated from the screening tables are within applicable impact limits can be safely assumed to have no adverse impacts in a site and development specific impact analysis.

Emission inventories were also compiled using estimates of VOC emissions and offsite particulate emissions from each development scenario. However, no modeling or quantitative assessments were made of ambient air quality impacts associated with those emissions.

3.0 MODELING METHODOLOGY

3.1 Brief Description of CALPUFF and ISCST3 Modeling Programs

The EPA-approved CALPUFF model was used in the screening mode for the long-range transport, deposition, and visibility analyses. The ISCST3 model utilized by UDAQ to assess impacts for minor sources was used to conservatively estimate impacts in the near field (within 50 kilometers of the activity being modeled). CALPUFF modeling results were analyzed to assess long-range transport (beyond 50 kilometer) pollutant concentrations and impacts on air quality and air quality related values including deposition of nitrates, deposition of sulfates, and visibility.

The ISCST3 modeling does not include any air chemistry analyses; it simply tracks emissions without chemical transformations during transport in the near field based upon meteorological data from local observation stations.

The CALPUFF model allows for chemical reaction. The modeling performed for this analysis utilized the MESOPUFF II chemical transformation process recommended for screening modeling by model developer Joseph Scire of Enviro-Tech, with relevant environmental parameters consistent with those proposed in the modeling protocol. Minor adjustments to initial land surface and land use parameters were made based upon UDAQ comments on the modeling protocol. CALPUFF model algorithms can account for the effects of changes in terrain from the meteorological data stations, which in the project area are generally located in valley bottoms, to receptors which could be at any elevation from valley bottom to mountain top.

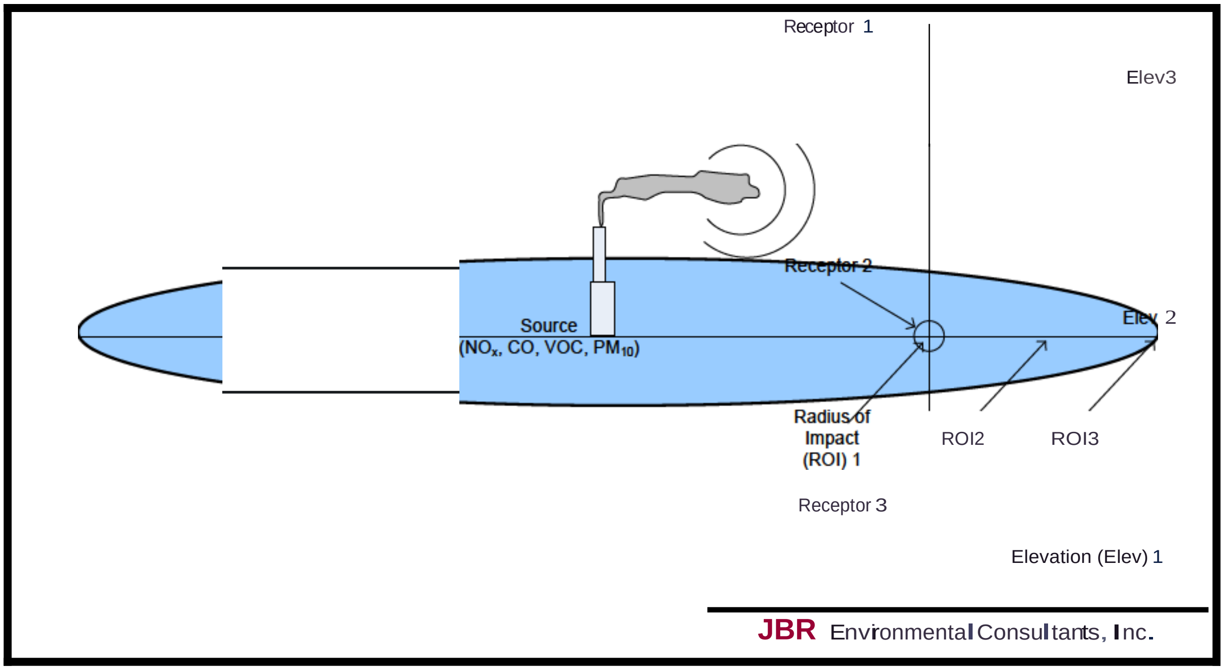
3.2 General Approach for this Analysis

Figure 3.2-1 on the following page visually depicts the modeling approach for the ISCST3 runs. The CALPUFF dispersion model is more refined in that it tracks emissions as a continuous series of puffs (numerical representations of emissions over a short period of time), which can expand or change transport direction as meteorological conditions change.

Impacts for each pollutant and AQRV were evaluated at a set of predetermined elevations in relation to the source and radius of impact (ROI, circles of increasing radius centered around the source). In the screening table runs, seven elevation scenarios were considered - one more than proposed in the project's modeling protocol based upon comments received from UDAQ. The 22 ROI utilized were unchanged from those proposed in the modeling protocol. At the intersection of each of the seven elevations and the 22 ROIs, a receptor is identified. Receptors are defined as the locations where quantitative air quality impacts are predicted.

Various types of receptor grids can be used by defining points on a polar coordinate system (see Figure 6.0-1), a Cartesian (x-y) coordinate system, or a combination of both systems. The receptor locations are documented in the receptor network section below. Maximum model predicted impact values on each radius from the source were reported and included in the screening tables (see Appendix A). All US airsheds are defined as Class I (pristine areas deserving special regulatory protection), Class II (typical airsheds, including most of the US), and Class III (a rarely used classification for industrial zones allowing higher air quality impacts). The model predicted maximum impacts can be compared against applicable Class I or Class II impact limits, or any other applicable impact limits, including FLAG guidelines on acceptable AQRV impact limits for planning purposes or EIS specific impact thresholds.

Figure 3.2-1 Modeling Methodology (for ISCST3)



3.3 Testing Applicability of Initial Screening Table

To evaluate applicability of the screening table results, ISCST3 and CALPUFF modeling was also performed for the specific development scenarios defined in Section 2.0 of this report. Those specific development scenarios were modeled at locations the Dixie and Fishlake NFs identified as conceivable for O&G development.

The emission sources and emission rates for these runs were identified based upon expectations for future development provided by the Dixie and Fishlake NFs. The section below provides more detail on model emission sources. The model emissions were distributed across the development area consistent with USFS descriptions of the development scenarios.

4.0 MODEL SOURCE DATA

4.1 Equipment Considerations for Preparing Emission Inventories

Assessments of equipment needed to support oil exploration and/or oil field development with some possibility of gas resources were prepared generally, and also specifically, for the three development scenarios. An inventory of emissions from all emission sources identified to support the potential oil (and possibly gas) development was prepared. Conservative assumptions were made of the type, size, and number of pieces for each equipment type, consistent with guidance from the USFS and the US EPA. Although natural gas was not expected to be found in economical quantities, a heated oil/gas/water separator, a compressor to move developable gas, and a gas flare were assumed in each oil field development scenario.

As recommended by the U.S. EPA, emissions from mobile and stationery combustion sources assume that engines associated with the potential development meet emission standards from recent EPA tiered emission limits. Generally, equipment was assumed to meet the minimum tiered emission requirements from approximately the last five years, allowing flexibility to the operator because of the comparatively small size of potential development activity anticipated. EPA reviewed and approved the engine emission estimates before the modeling analyses were performed. EPA indicated that more recent engines would likely be required for resource development larger in scale or concentration than the scenarios considered in this analysis.

Emission estimates assume that all vehicular travel is on unpaved surfaces, and that there is no electrical power service onsite, so all major equipment onsite is fossil fuel fired.

In the screening modeling analyses, all model sources were assumed to be collected at a central point, with grid origin with relative coordinates (0,0). That gridding allowed the screening model results to be used to estimate impacts from a variety of development options, from simple projects like an individual exploratory well to more complicated ones like expansive well field developments.

Table 4.1-1 below documents the types of equipment associated with air emissions under the screening model scenario. The emission data from the screening modeling analyses includes the total onsite emissions associated with potential development normalized at 1.0 pound per hour.[1] These emissions are allocated proportionally among equipment and emission stacks as point sources (stacks) or area sources (areas from which non-stack fugitive emissions like dust occur) consistent with regional development scenarios. To be conservative, the emissions profile shown here assumes oil extraction efforts for each scenario, with a small component consistent with gas flaring or processing. The screening model emissions were allocated in model emissions sources listed in Table 4.1-1 with associated stack parameters. The emissions values found in Table 4.1-1 represent the normalized screening emission rates. They represent the proportion of overall emissions of the pollutant from that source in the screening model, not the actual total emissions calculated for each piece of equipment.

[1] In the screening model, the emissions entry for each source represents the percentage of the emissions of that pollutant for that source. The sum of the normalized emissions for the entire development is 100%, or 1.00 lb/hr.

Table 4.1-1 Screening Model Sources and Source Parameters

Point Source ID	Source Description	Easting (X)	Northing (Y)	Stack Height	Temp	Exit Velocity	Stack Diam.	PM_{10}	NOx	SO_2	CO
		(m)	(m)	(ft)	(°F)	(fps)	(ft)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)
Reciprocating Internal Combustion Engines (RICE) / Turbines											
DRE	Drill Rig Engine	0.0	0.0	15.0	950.0	75.0	1	0.1122	0.2950	0.0024	0.0982
WP1	Well Pump	0.0	0.0	10.0	775.0	45.0	0.667	0.4112	0.4610	0.9954	0.3494
RICE / Turbine emission totals								0.5234	0.7561	0.9978	0.4476
Use or flare NG											
Flare	Exploration Flare	0.0	0.0	85.0	1000.0	51.0	1.5	0.0000	0.0384	0.0000	0.1284
Flare	Production Flare	0.0	0.0	85.0	1000.0	51.0	1.5	0.0000	0.0852	0.0000	0.2850
HT1	Heater Treater	0.0	0.0	20.0	180.0	15.0	0.67	0.0307	0.0332	0.0014	0.0171
Use or Flare NG emission totals								0.0307	0.1568	0.0014	0.4305
NG development											
DHY1	Dehydrator	0.0	0.0	30.0	200.0	8.0	1	0.0031	0.0033	0.0001	0.0017
CM1	Compressor Engine	0.0	0.0	25.0	760.0	95.0	1	0.0189	0.0768	0.0007	0.0944
NG development emission totals								0.0220	0.0802	0.0008	0.0962
Dust: Ground dist, vehicles, etc …				Release Height	Radius of Circle	Number of Vertices	Vertical Dimension				
Area Circle Source ID				(ft)	(ft)		(ft)				
	Fugitives	0.0	0.0	10.0	300.0		20	0.4239	0.0070	0.0000	0.0257
TOTAL EMISSIONS								**1.000**	**1.000**	**1.000**	**1.000**

- The uppermost shaded **table section** includes **stack emissions from reciprocating engines or turbines**. This emission category includes well pumps needed to extract oil as well as onsite well drilling rigs with diesel powered drilling engines. Consistent with emissions from regional oil development fields, the total onsite emissions from this source category represented the majority of emissions in the normalized screening model analysis. The emissions of SO_2 from the well pumps, approved by EPA reviewers, are conservative because they are from EPA's AP-42 emission factor guidance document from before recent efforts to reduce diesel fuel sulfur content. This is unlike the AP-42 emission factors for the larger well drilling engine which accounted for the low sulfur fuel that will be required during the project's operational phase.

- The first unhighlighted section includes **emissions associated with processing or using natural gas** expected to be found at least in small quantities in oil development fields. The total onsite emissions from this category make up about 10 percent of total emissions for most pollutants, though flaring could make up a larger percentage of emissions of sulfur dioxide and related compounds.

- The second shaded **section** includes **emissions** that would be expected with **low volumes of natural gas development**. Because developable natural gas is not expected in any appreciable volume, this category represents no more than two percent of the normalized 1.0 lb/hr emissions in this screening analysis.

► The lowest unhighlighted **table section represents onsite fugitive emissions** not vented through a stationary stack. This category includes fugitive dust emissions from vehicular exhaust and road dust, wind erosion from disturbed ground surfaces, and emissions including valve and tank leakage from handling resources and supplies. This category represents the major component for particulate emissions, but includes lower percentages of emissions from the other criteria pollutants studied (NO_x, SO_2, and CO).

► The **bold red Total Emissions** in the highlighted bottom section under each pollutant's column show that cumulative screening model emissions for each pollutant were 1.0 pound per hour.

4.2 Evaluating Applicability of Model Results Screening

To evaluate applicability of the results from the screening modeling analyses, model source data sets were prepared for the specific well field development scenarios described as reasonable by local USFS personnel. The Dixie NF development scenario described and modeled is understood to be based upon the only active energy development activity occurring on that NF. Similarly, the development scenario proposed by the Fishlake NF and modeled for this analysis is understood to be based upon the one existing energy field development there.

For the specific development scenario modeling analyses, model sources were identified and their emissions estimated based upon expected operating scenarios. They were allocated across the development field consistent with descriptions of each scenario provided by the respective NFs. Each of the well field development scenarios were assumed to cover three to three and a half square miles, include specified numbers of wells footprints, and be operated consistent with scenario information provided by each NF. Each scenario included the volume of vehicular traffic expected to be needed to support those efforts.

4.3 References

References utilized in preparing the emission inventory included Utah State Government's "Analysis of Emissions from Oil and Gas Wells in Utah," the Oil & Gas Emission Inventory Workbook for the Uinta Basin Study, similar data from the Four Corners Oil & Gas Development Study, information from existing oil field development on the Dixie and Fishlake NF, and regional and national O&G field emission analyses and emission factors.

The Uinta Basin Study was especially helpful in supplying county-wide cumulative inventories of air emissions from recent development of O&G field development in Uinta and Duchesne Counties, Utah. That data, similar information from a Four Corners area study, and information about existing O&G field developments on the Dixie and Fishlake NFs provided the main basis for allocating the PM_{10}, NOx, and SO_2 emissions among source types and categories in the model. This information was also used in the screening model runs to allocate the normalized 1 lb/hr of emissions proportionally among a variety of emissions sources, each with representative stack parameters and model emissions scenarios. This also helped in the quality assurance reviews of emissions inventories for the specific development scenario modeling analyses. It ensured that the model emissions were allocated among likely sources consistent with emission inventories from existing regional and local O&G developments.

Vehicle traffic volume estimates were prepared consistent with the “Highway Freight Traffic Associated with Development of Oil and Gas Wells” document prepared in 2006 by Daniel Kuhn of the Utah Department of Transportation.

4.4 Dixie National Forest Development Scenario Modeling (Scenario 2)

The Dixie NF development scenario was prescribed to be one conventional 20-well oil field. Each well would be on a separate pad with ground disturbance per pad of 5.9 acres. The total new actual ground disturbance including original discovery well, production well pads, new roads, reconstruction of existing roads, central production facility, water disposal well, overhead power line and substation, field pipeline/power line corridors, and truck loading area is estimated at 263 acres. The general area within the perimeter of the field including pads, pad access roads, and interior pipelines and power lines, and undisturbed areas between, is estimated at approximately 3.5 square miles. Well spacing of 160 acres around each well was used for this special estimate as recommend by Dixie NF.

Table 4.4-1 on the following page documents the model emission sources used to simulate emissions from the 20- well field development scenario. Note that the emission sources are distributed over 3.5 square miles in a manner consistent with the spread of the well field scenario at a typical location within the Dixie NF, with variations in elevations across the development field and across the receptor network. This was performed to check the representativeness of the screening table results on actual field type development conditions. Figures 5.1-1 and 5.1-2 of this document provide a visual representation of their layout.

Table 4.4-1 Dixie National Forest 20-Well Oil Field Development Scenario Model Sources and Source Parameters

Source ID	Source Description	Easting (X)	Northing (Y)	Base Elev	Stk Ht	Temp	Exit Vel	Stk Diam.	PM_{10}	NOx	SO_2
POINT SOURCES		(m)	(m)	(ft)	(ft)	(°F)	(fps)	(ft)	(lb/hr)	(lb/hr)	(lb/hr)
DRE	Drill Rig Engine	427831	4209861	9448	15	950.0	75	1.0	0.26	8.47	0.01
FLARE	Production Flare	427781	4209911	9480	100	1000.0	55	1.5	0.00	3.55	0.00
CM1	Compressor Engine	427831	4209961	9455	25	760.0	95	1.0	0.04	2.20	0.00
HT1	Heater Treater	426936	4208986	9472	20	180.0	15	0.7	0.004	0.05	0.00
HT2	Heater Treater	427489	4208796	9416	20	180.0	15	0.7	0.004	0.05	0.00
HT3	Heater Treater	428269	4208686	9431	20	180.0	15	0.7	0.004	0.05	0.00
HT4	Heater Treater	428861	4208911	9486	20	180.0	15	0.7	0.004	0.05	0.00
HT5	Heater Treater	429086	4209503	9524	20	180.0	15	0.7	0.004	0.05	0.00
HT6	Heater Treater	429086	4210319	9462	20	180.0	15	0.7	0.004	0.05	0.00
HT7	Heater Treater	428861	4210911	9542	20	180.0	15	0.7	0.004	0.05	0.00
HT8	Heater Treater	428269	4211136	9472	20	180.0	15	0.7	0.004	0.05	0.00
HT9	Heater Treater	427453	4211136	9538	20	180.0	15	0.7	0.004	0.05	0.00
HT10	Heater Treater	426861	4210911	9425	20	180.0	15	0.7	0.004	0.05	0.00
HT11	Heater Treater	426636	4210319	9409	20	180.0	15	0.7	0.004	0.05	0.00
HT12	Heater Treater	426636	4209508	9381	20	180.0	15	0.7	0.004	0.05	0.00
HT13	Heater Treater	427236	4209286	9383	20	180.0	15	0.7	0.004	0.05	0.00
HT14	Heater Treater	428486	4209286	9440	20	180.0	15	0.7	0.004	0.05	0.00
HT15	Heater Treater	428486	4210536	9527	20	180.0	15	0.7	0.004	0.05	0.00
HT16	Heater Treater	427236	4210536	9447	20	180.0	15	0.7	0.004	0.05	0.00
HT17	Heater Treater	427161	4209911	9373	20	180.0	15	0.7	0.004	0.05	0.00
HT18	Heater Treater	427861	4209211	9386	20	180.0	15	0.7	0.004	0.05	0.00
HT19	Heater Treater	428561	4209911	9464	20	180.0	15	0.7	0.004	0.05	0.00
HT20	Heater Treater	427861	4210611	9554	20	180.0	15	0.7	0.004	0.05	0.00
DHY1	Dehydrator	426906	4208956	9482	30	200.0	8	1.0	0.004	0.05	0.00
DHY4	Dehydrator	428831	4208881	9488	30	200.0	8	1.0	0.004	0.05	0.00
DHY7	Dehydrator	428831	4210881	9507	30	200.0	8	1.0	0.004	0.05	0.00
DHY10	Dehydrator	426831	4210881	9420	30	200.0	8	1.0	0.004	0.05	0.00
WP1	Well Pump	426906	4209016	9472	10	775.0	45	0.7	0.05	0.66	0.21
WP2	Well Pump	427459	4208826	9418	10	775.0	45	0.7	0.05	0.66	0.21
WP3	Well Pump	428239	4208716	9426	10	775.0	45	0.7	0.05	0.66	0.21
WP4	Well Pump	428831	4208941	9482	10	775.0	45	0.7	0.05	0.66	0.21
WP5	Well Pump	429056	4209533	9524	10	775.0	45	0.7	0.05	0.66	0.21
WP6	Well Pump	429056	4210349	9462	10	775.0	45	0.7	0.05	0.66	0.21
WP7	Well Pump	428831	4210941	9544	10	775.0	45	0.7	0.05	0.66	0.21
WP8	Well Pump	428239	4211166	9471	10	775.0	45	0.7	0.05	0.66	0.21
WP9	Well Pump	427423	4211166	9533	10	775.0	45	0.7	0.05	0.66	0.21

Source ID	Source Description	Easting (X)	Northing (Y)	Base Elev	Stk Ht	Temp	Exit Vel	Stk Diam.	PM_{10}	NOx	SO_2
POINT SOURCES		(m)	(m)	(ft)	(ft)	(°F)	(fps)	(ft)	(lb/hr)	(lb/hr)	(lb/hr)
WP10	Well Pump	426831	4210941	9422	10	775.0	45	0.7	0.05	0.66	0.21
WP11	Well Pump	426606	4210349	9409	10	775.0	45	0.7	0.05	0.66	0.21
WP12	Well Pump	426606	4209538	9380	10	775.0	45	0.7	0.05	0.66	0.21
WP13	Well Pump	427206	4209316	9380	10	775.0	45	0.7	0.05	0.66	0.21
WP14	Well Pump	428456	4209316	9440	10	775.0	45	0.7	0.05	0.66	0.21
WP15	Well Pump	428456	4210566	9524	10	775.0	45	0.7	0.05	0.66	0.21
WP16	Well Pump	427206	4210566	9447	10	775.0	45	0.7	0.05	0.66	0.21
WP17	Well Pump	427131	4209941	9372	10	775.0	45	0.7	0.05	0.66	0.21
WP18	Well Pump	427831	4209241	9390	10	775.0	45	0.7	0.05	0.66	0.21
WP19	Well Pump	428531	4209941	9459	10	775.0	45	0.7	0.05	0.66	0.21
WP20	Well Pump	427831	4210641	9551	10	775.0	45	0.7	0.05	0.66	0.21

Source ID	Source Description	Easting (X)	Northing (Y)	Base Elev	Release Height	Horz. Dim.	Vert. Dim.	PM_{10}	NOx	SO_2
VOLUME SOURCES		(m)	(m)	(ft)	(ft)	(ft)	(ft)	(lb/hr)	(lb/hr)	(lb/hr)
ORD1	outer road	427831	4208536	9414	2.0	100	6.0	0.04	0.01	
ORD2	outer road	427183	4208891	9445	2.0	75	6.0	0.04	0.01	
ORD3	outer road	426719	4209207	9476	2.0	75	6.0	0.04	0.01	
ORD4	outer road	426456	4209911	9427	2.0	100	6.0	0.04	0.01	
ORD5	outer road	426719	4210615	9413	2.0	75	6.0	0.04	0.01	
ORD6	outer road	427127	4211024	9483	2.0	75	6.0	0.04	0.01	
ORD7	outer road	427831	4211286	9477	2.0	100	6.0	0.04	0.01	
ORD8	outer road	428535	4211024	9469	2.0	75	6.0	0.04	0.01	
ORD9	outer road	428944	4210615	9469	2.0	75	6.0	0.04	0.01	
ORD10	outer road	429206	4209911	9471	2.0	100	6.0	0.04	0.01	
ORD11	outer road	428944	4209207	9495	2.0	75	6.0	0.04	0.01	
ORD12	outer road	428535	4208799	9460	2.0	75	6.0	0.04	0.01	
IRD1	inner road	427519	4209249	9391	2.0	75	6.0	0.04	0.01	
IRD2	inner road	427169	4209599	9367	2.0	75	6.0	0.04	0.01	
IRD3	inner road	427169	4210224	9392	2.0	75	6.0	0.04	0.01	
IRD4	inner road	427519	4210574	9511	2.0	75	6.0	0.04	0.01	
IRD5	inner road	428144	4210574	9567	2.0	75	6.0	0.04	0.01	
IRD6	inner road	428494	4210224	9521	2.0	75	6.0	0.04	0.01	
IRD7	inner road	428494	4209599	9452	2.0	75	6.0	0.04	0.01	
IRD8	inner road	428144	4209249	9393	2.0	75	6.0	0.04	0.01	

Source ID	Source Description	Easting (X)	Northing (Y)	Base Elev	Rel Ht	Radius of Circle	Vert. Dim	PM_{10}	NOx	SO_2
CIRCULAR AREA SOURCES		(m)	(m)	(ft)	(ft)	(ft)	(ft)	(lb/hr)	(lb/hr)	(lb/hr)
WELPAD1	Disturbed area - well pad	426831	4208911	9491	0.0	282.7	2.00	0.015		
WELPAD2	Disturbed area - well pad	427423	4208686	9430	0.0	282.7	2.00	0.015		
WELPAD3	Disturbed area - well pad	428239	4208686	9428	0.0	282.7	2.00	0.015		
WELPAD4	Disturbed area - well pad	428831	4208911	9485	0.0	282.7	2.00	0.015		
WELPAD5	Disturbed area - well pad	429056	4209503	9524	0.0	282.7	2.00	0.015		
WELPAD6	Disturbed area - well pad	429056	4210319	9462	0.0	282.7	2.00	0.015		
WELPAD7	Disturbed area - well pad	428831	4210911	9526	0.0	282.7	2.00	0.015		
WELPAD8	Disturbed area - well pad	428239	4211136	9474	0.0	282.7	2.00	0.015		
WELPAD9	Disturbed area - well pad	427423	4211136	9533	0.0	282.7	2.00	0.015		
WELPAD10	Disturbed area - well pad	426831	4210911	9422	0.0	282.7	2.00	0.015		
WELPAD11	Disturbed area - well pad	426606	4210319	9409	0.0	282.7	2.00	0.015		
WELPAD12	Disturbed area - well pad	426606	4209508	9385	0.0	282.7	2.00	0.015		
WELPAD13	Disturbed area - well pad	427206	4209286	9385	0.0	282.7	2.00	0.015		
WELPAD14	Disturbed area - well pad	428456	4209286	9437	0.0	282.7	2.00	0.015		
WELPAD15	Disturbed area - well pad	428456	4210536	9532	0.0	282.7	2.00	0.015		
WELPAD16	Disturbed area - well pad	427206	4210536	9442	0.0	282.7	2.00	0.015		
WELPAD17	Disturbed area - well pad	427131	4209911	9372	0.0	282.7	2.00	0.015		
WELPAD18	Disturbed area - well pad	427831	4209211	9386	0.0	282.7	2.00	0.015		
WELPAD19	Disturbed area - well pad	428531	4209911	9458	0.0	282.7	2.00	0.015		
WELPAD20	Disturbed area - well pad	427831	4210611	9550	0.0	282.7	2.00	0.015		
CENTPROC	50 acres dist center proc	427831	4209911	9453	0.0	832.6	2.00	0.1		

4.5 Fishlake National Forest Development Scenario Modeling (Scenario 3)

The Fishlake NF development scenario model consisted of one, 10 to 15-well field on the Fishlake NF using directional drilling technology. The scenario described two or three production pads with each pad hosting up to five wells each, using directional drilling technology and an offset distance of one-half mile. The modeled scenario included 12 wells on three pads. Total actual ground disturbance including the discovery well, central production facilities pad, production pads, water disposal well, new access roads, reconstruction of existing roads, pipelines and power lines, and a truck loading facility is estimated at 122-acres. The area within the perimeter of the field including pads, pad access roads, and interior pipelines and power lines, and undisturbed areas between could vary, but is estimated at approximately 3.0 square miles using a well spacing of 160 acres (or ½ mile distance between down-hole well termini (directional drilling).

Table 4.5-1 on the following page documents the model emissions sources used to simulate emissions from this well field development scenario. As with the Dixie NF development scenario modeling analysis, on the ground considerations were added by distributing the model emission sources over three square miles. The sources were distributed in a manner consistent with the anticipated spread of the well field scenario at a conceivable location in the Fishlake

NF, with variations in elevations across the development field and across the receptor network based upon actual topography in the modeled location. Figures in the next section of this document will provide a visual representation of their layout.

Table 4.5-1 Fishlake National Forest Directional Drilling Oil Field Development Scenario Model Sources and Source Parameters

Source ID	Source Description	Easting (X)	Northing (Y)	Base Elev	Stack Height	Temp	Exit Velocity	Stk Diam	PM_{10}	NOx	SO_2
POINT SOURCES		**(m)**	**(m)**	**(ft)**	**(ft)**	**(°F)**	**(fps)**	**(ft)**	**(lb/hr)**	**(lb/hr)**	**(lb/hr)**
DRE	Drill Rig Engine	381262	4277427	8200	15	950	75	1.00	0.26	8.47	0.01
PFLAR	Production Flare	381212	4277417	8184	100	1000	55	1.50	0.00	3.55	0.00
COMPR	Compressor Engine	381312	4277417	8222	25	760	95	1.00	0.04	2.20	0.00
HT1	Heater Treater	380332	4276797	8081	20	180	15	0.67	0.004	0.05	0.00
HT2	Heater Treater	380392	4276797	8081	20	180	15	0.67	0.004	0.05	0.00
HT3	Heater Treater	380392	4276737	8081	20	180	15	0.67	0.004	0.05	0.00
HT4	Heater Treater	380332	4276737	8081	20	180	15	0.67	0.004	0.05	0.00
HT5	Heater Treater	382332	4277497	8521	20	180	15	0.67	0.004	0.05	0.00
HT6	Heater Treater	382392	4277497	8483	20	180	15	0.67	0.004	0.05	0.00
HT7	Heater Treater	382392	4277437	8481	20	180	15	0.67	0.004	0.05	0.00
HT8	Heater Treater	382332	4277437	8519	20	180	15	0.67	0.004	0.05	0.00
HT9	Heater Treater	381032	4278147	8162	20	180	15	0.67	0.004	0.05	0.00
HT10	Heater Treater	381092	4278147	8151	20	180	15	0.67	0.004	0.05	0.00
HT11	Heater Treater	381092	4278087	8163	20	180	15	0.67	0.004	0.05	0.00
HT12	Heater Treater	381032	4278087	8166	20	180	15	0.67	0.004	0.05	0.00
DHY1	Dehydrator	381262	4277467	8213	30	200	8	1.00	0.004	0.05	0.00
DHY2	Dehydrator	381262	4277367	8203	30	200	8	1.00	0.004	0.05	0.00
WP1	Well Pump	380312	4276817	8081	10	775	45	0.67	0.05	0.66	0.21
WP2	Well Pump	380412	4276817	8082	10	775	45	0.67	0.05	0.66	0.21
WP3	Well Pump	380412	4276717	8081	10	775	45	0.67	0.05	0.66	0.21
WP4	Well Pump	380312	4276717	8081	10	775	45	0.67	0.05	0.66	0.21
WP5	Well Pump	382312	4277517	8531	10	775	45	0.67	0.05	0.66	0.21
WP6	Well Pump	382412	4277517	8481	10	775	45	0.67	0.05	0.66	0.21
WP7	Well Pump	382412	4277417	8472	10	775	45	0.67	0.05	0.66	0.21
WP8	Well Pump	382312	4277417	8525	10	775	45	0.67	0.05	0.66	0.21
WP9	Well Pump	381012	4278167	8164	10	775	45	0.67	0.05	0.66	0.21
WP10	Well Pump	381112	4278167	8151	10	775	45	0.67	0.05	0.66	0.21
WP11	Well Pump	381112	4278067	8166	10	775	45	0.67	0.05	0.66	0.21
WP12	Well Pump	381012	4278067	8172	10	775	45	0.67	0.05	0.66	0.21

Source ID	Source Description	Easting (X)	Northing (Y)	Base Elevation	Release Height	Horiz Dim	Vert Dim	PM_{10}	NOx	SO_2
VOLUME SOURCES		(m)	(m)	(ft)	(ft)	(ft)	(ft)	(lb/hr)	(lb/hr)	(lb/hr)
ORD1	outer road	381262	4276042	8116	2.0	100	6.0	0.04	0.075	
ORD2	outer road	380558	4276305	8097	2.0	75	6.0	0.04	0.075	
ORD3	outer road	380150	4276713	8072	2.0	75	6.0	0.04	0.075	
ORD4	outer road	379887	4277417	8052	2.0	100	6.0	0.04	0.075	
ORD5	outer road	380150	4278121	8283	2.0	75	6.0	0.04	0.075	
ORD6	outer road	380558	4278530	7977	2.0	75	6.0	0.04	0.075	
ORD7	outer road	381262	4278792	8219	2.0	100	6.0	0.04	0.075	
ORD8	outer road	381966	4278530	8318	2.0	75	6.0	0.04	0.075	
ORD9	outer road	382375	4278121	8527	2.0	75	6.0	0.04	0.075	
ORD10	outer road	382637	4277417	8468	2.0	100	6.0	0.04	0.075	
ORD11	outer road	382375	4276713	8450	2.0	75	6.0	0.04	0.075	
ORD12	outer road	381966	4276305	8200	2.0	75	6.0	0.04	0.075	
IRD1	inner road	380950	4276755	8184	2.0	75	6.0	0.04	0.075	
IRD2	inner road	380600	4277105	8144	2.0	75	6.0	0.04	0.075	
IRD3	inner road	380600	4277730	8225	2.0	75	6.0	0.04	0.075	
IRD4	inner road	380950	4278080	8194	2.0	75	6.0	0.04	0.075	
IRD5	inner road	381575	4278080	8334	2.0	75	6.0	0.04	0.075	
IRD6	inner road	381925	4277730	8439	2.0	75	6.0	0.04	0.075	
IRD7	inner road	381925	4277105	8321	2.0	75	6.0	0.04	0.075	
IRD8	inner road	381575	4276755	8249	2.0	75	6.0	0.04	0.075	

Source ID	Source Description	Easting (X)	Northing (Y)	Base Elev	Rel Ht	Radius of Circle	Vert Dim	PM_{10}	NOx	SO_2
		(m)	(m)	(ft)	(ft)	(ft)	(ft)	(lb/hr)	(lb/hr)	(lb/hr)
WELPAD1	Disturbed area - well pad	380362	4276767	8081	0	282.7	2.0	0.033		
WELPAD2	Disturbed area - well pad	382362	4277467	8498	0	282.7	2.0	0.033		
WELPAD3	Disturbed area - well pad	381062	4278117	8156	0	282.7	2.0	0.033		
CENTPROC	50 acres dist center proc	381262	4277417	8199	0	832.6	2.0	0.1		

4.6 Fugitive Emissions in the Development Scenario Modeling

Actual development scenarios would include fugitive sources of VOCs and particulates; only particulates can be modeled. The development scenario model runs include area and/or volume sources to assess the impacts of particulate emissions from ground disturbance and criteria pollutant emissions from vehicular traffic. The onsite emissions were evenly distributed around the facility in the model, with concentrations relatively even across the area. This is considered conservative in this analysis, where the nearest receptors are 0.25 kilometers (0.155 miles) away, closer to the center of activity than some of the wells. The percentages of overall traffic emissions that occur within the project boundary, as opposed to outside that boundary, were estimated high. Road and disturbed area emissions occurring outside the identified project area are included in the emissions inventory, but their impacts were not modeled.

5.0 MODEL FACILITY AND SOURCE LAYOUT

The emissions scenarios for the screening table runs included eight model emission sources: seven point sources, and a fugitive area source. These runs were scaled to be representative of actual emissions from anticipated O&G development.

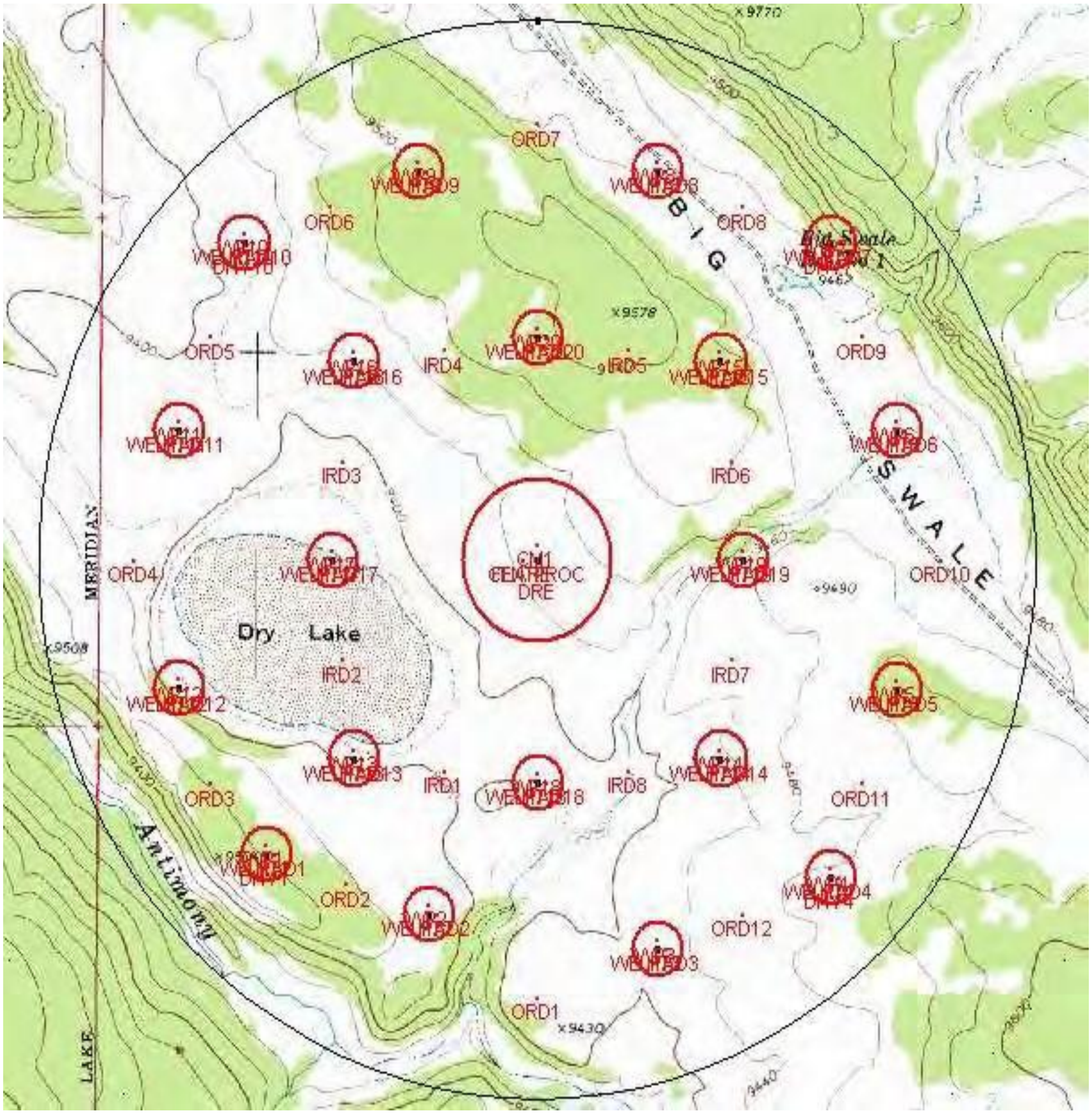
The screening tables prepared from the screening runs were checked for accuracy. The results were compared to the development scenario runs with model emissions laid out using on the ground locations in the Dixie and Fishlake NFs. Those model scenarios were based upon development scenarios determined by the USFS. The methodology for setting up and laying out these specific development scenario model runs is described below. These runs also assisted in defining model source data for the screening table runs.

Building downwash was not considered because the nearest receptors were well beyond all building or structure cavities. While actual locations within the respective NF, both sites selected were chosen at random, with a relatively flat area to locate the well field being the only criteria.

5.1 Dixie National Forest Well Field Layout

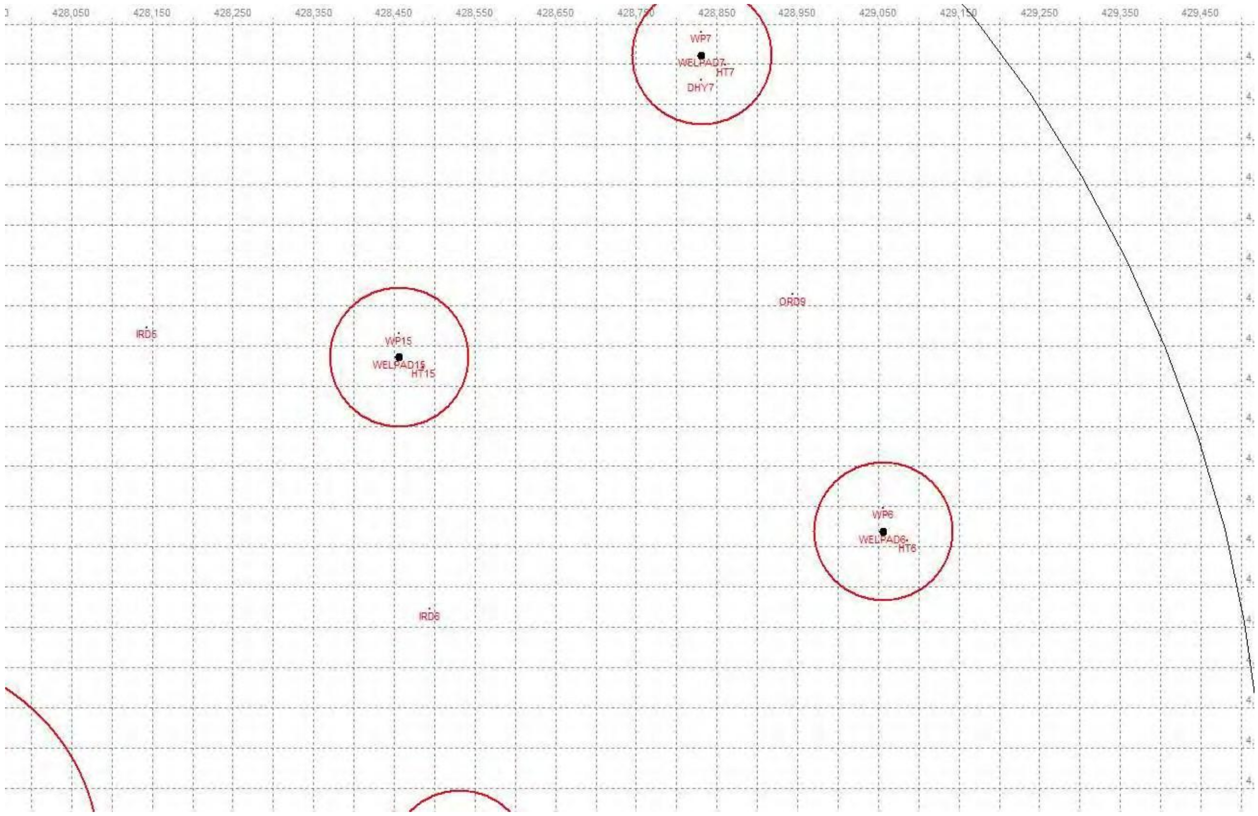
Figure 5.1-1 shows the representative ISCST3 model layout for the Dixie NF 20-well field that is used as one of the three specific development scenarios modeled. The black circle represents a 3.5 square mile area boundary anticipated by the USFS. The underlying topographic map shows the hypothetical location modeled at Big Swale on the Pollywog Lake United States Geological Survey (USGS) topographic map, approximately twelve miles ESE of Antimony, Utah. Model emission sources are shown and labeled in red. The layout shows 20 well pads located around a central processing area. The central processing area includes one gas flare, storage tanks, one well drilling rig, and the potential gas compressor engine. The fugitive emissions from roads and disturbed areas, other than well pads and the central processing area, were included in the model by a series of 20 area or volume sources distributed between the well pads. They are shown as red dots labeled “ORDx” or “IRDx” (for inner or outer roads).

Figure 5.1-1 ISCST3 Model: Dixie National Forest 20-Well Oil Field Scenario Facility Layout



For a representative set of well pads, Figure 5.1-2 shows details of what is located near each well pad. Heater / treater separators for natural gas are included with some wells, but are assumed to operate at very low volumes. Figure 5.1-2 shows the inner ring depicting the central processing area to the lower left and the outer ring showing the extent of the well field to the upper right. Between the well pads, representative model inner and outer road sources seen in red are used to depict emissions conservatively estimated from onsite vehicular traffic.

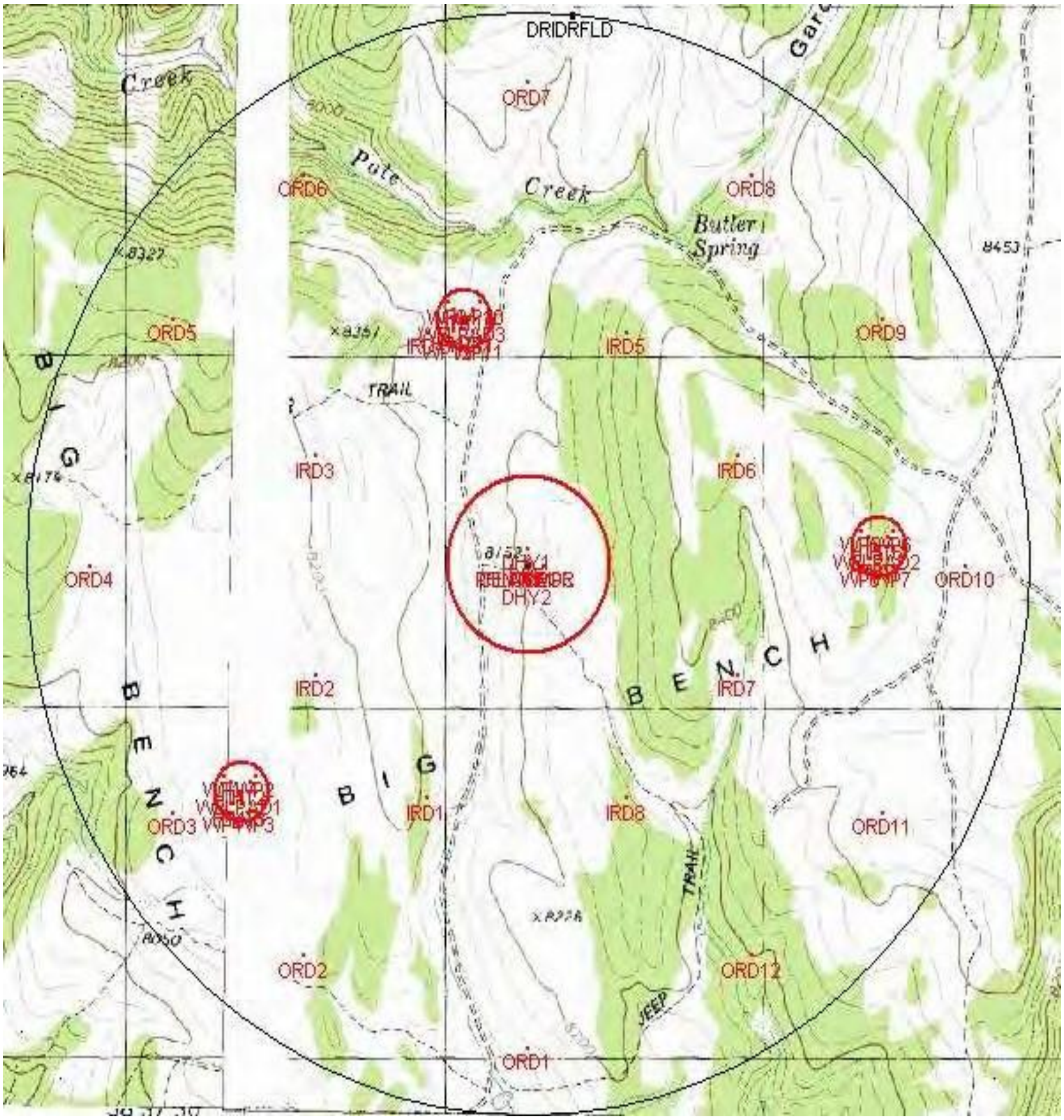
Figure 5.1-2 ISCST3 Model Source Layout: Each Well Field, Either Oil Field Scenario



5.2 Fishlake National Forest Well Field Layout

Based on USFS development expectations, the 10 to 15 well Fishlake NF directional drilling oil field development model scenario featured fewer well pads over a slightly smaller area than the Dixie NF well field, with potentially more concentrated activity in the vicinity of each well. Figure 5.2-1 shows the representative ISCST3 model layout for the hypothetical 12-well directional drilling oil field that was used as one of the specific development scenarios. The black circle represents a 3-square mile area boundary for the entire field. The underlying topographic map shows the hypothetical location modeled at Big Bench on the Joseph Peak USGS topographic map, approximately eight miles WSW of Joseph, Utah in the Fillmore District.

Figure 5.2-1 ISCST3 Model: FNF 12-Well Directional, Drilling Field Scenario Facility Layout



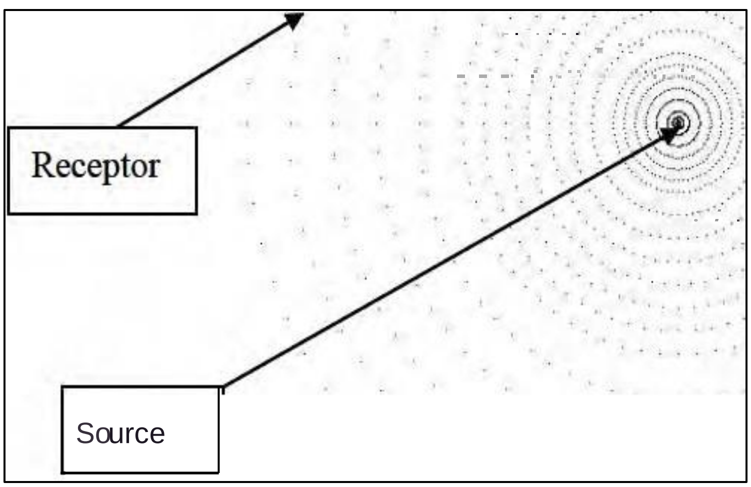
5.3 Exploratory Well Development Scenario (Scenario 1) Layout

The exploration development scenario model includes all emissions within an area consisting of a 5.9 acre pad with 9 to 10.7 acres of road and other surface disturbances around or atop the pad. Given that the nearest receptor was 250-meters away, the screening scenario with all sources collocated was assumed to be representative of an isolated exploratory oil well.

6.0 MODEL DOMAIN, MAPPING, AND RECEPTOR NETWORK

The model receptor network extends to 200 kilometers (km) from the area of activity. The receptor network for the analyses includes rings of receptors around the activity area at distances of 0.25, 0.5, 1, 2.5, 5, 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100, 120, 140, 160, 180, and 200 km (Figure 6.0-1). Receptors were placed at 10 degree intervals around the receptor rings within 50 km and at 5 degree intervals around the long range transport receptor rings. The expanded receptor network at longer distances cut down the distance receptors at these larger outer rings. The figure below shows the model receptor network. The model domain was set conservatively beyond the furthest extent of the receptor network.

Figure 6.0-1 Model Receptor Network



The ISCST3 model was used for pollutant concentrations within 50 km (approximately 31 miles) of the activity area and the CALPUFF model beyond that distance, consistent with EPA long-range transport and UDAQ air quality modeling guidance. All deposition and visibility AQRV impact modeling was also performed using CALPUFF and its CALPOST post processing system (version 6.12). For the short term, 3-hour and 24-hour average standard, CALPUFF analyses were used to supplement ISCST3 analyses of SO_2 dispersion in the near field. ISCST3 analyses extrapolated short term effects of low overnight inversion mixing heights from valley observation sites questionably representative of anticipated development sites and/or unlikely to persist for the duration ISCST3 applied them. CALPUFF's enhanced boundary layer data and model calculations allowed a more realistic estimate of dispersion of the S02 emissions, which were primarily from well pumps.

6.1 Receptor Network

The receptor network for the screening modeling included seven source/receptor elevation differences. Separate model runs for each elevation difference scenario were performed with receptors at 2500, 1000, 500, and 100 feet above the source elevation, at the same elevation as the source, and at 1,000 and 2,500 feet below the source. These elevation difference scenarios include the five described in the modeling protocol, plus two more with receptors 500 feet and 100 feet above the model sources. Those added receptor elevations were based upon UDAQ comment that this elevation can often have highest impacts due to close proximity to the mean plume height. The base elevation for the emission sources in the model was set at 6,000 feet, which is considered a reasonable approximation of likely development sites within the two NFs. This receptor network was used for both the ISCST3 and CALPUFF screening modeling runs for criteria pollutant impact, AQRV's and deposition impacts.

In the case of the ISCST3 and CALPUFF specific development scenario model runs, receptors were set at actual elevations corresponding to the distance rings described for the screening runs. The elevations of those receptors were calculated from USGS digital elevation model (DEM) data for receptors at each receptor ring distance, every 10 degrees around the inner rings and every 5 degrees around the outer rings (see Figure 6.0-1).

The ambient air boundary (point beyond which the public has access) for the specific development scenario model runs in the June 2008 version of this modeling report was the edge of the activity area, the 3-square mile area for the Fishlake NF directional drilling scenario and the 3.5 square mile area for the Dixie NF conventional drilling scenario. Based on agency comments, the analysis conducted in this current version of this modeling report refined the receptor network to begin at the fence surrounding the central processing area, assuming that the public could have access to areas beyond there including around the well pads.

6.2 Visibility and Deposition Analyses

The CALPUFF visibility and wet deposition analyses required extended hourly surface meteorological data sets including relative humidity. The only site near the study area with EPA-approved surface meteorological data was Cedar City. Therefore, Cedar City meteorological data prepared from SAMSON data sets with extended ISCST3 parameters was used for the visibility and deposition analyses. Specific development scenario model runs for air pollutant concentrations for potential development scenarios on the two NFs utilized multiple meteorological data files for added conservatism. The details of meteorological data used in specific development scenario model runs are described in Section 7.0.

Light is scattered by particles in the air. In clear weather, visibility decreases as light scattering increases. The amount of light scattering is a function of the quantity and size of particulates in the air. Light extinction is quantified as beta extinction (B_{ext}). Visibility model results calculated the visibility degradation measured by increases in B_{ext}. The predicted increase in B_{ext} was calculated and interpreted for each scenario to conservatively estimate visibility degradation in the form of number of days with visibility degradation exceeding 0.5 and 1.0 deciviews (defined as a 5% or 10% increase in B_{ext} respectively). A 0.5 deciview visibility impact in Class I airsheds is defined by FLAG as a level of concern above which a cumulative visibility impact analysis is recommended if occurring with any frequency. A 1 deciview or higher impact in Class I areas is set as the FLAG threshold at which Class I area land managers would be inclined to oppose the impacting project. For conservatism, a background concentration of 15.6 mm^{-1} was assumed.

This is consistent with the most pristine background visibility in regional Class I airsheds, thus minimizing the impact that would result in the percentage change thresholds being triggered.

7.0 METEOROLOGICAL DATA

The normalized model analyses used to prepare the screening tables utilized ISCST3-based screening meteorological data files and/or regional ISCST3 meteorological data files. The ISCST3 data files with extended meteorological data were needed for AQRV analyses (visibility and deposition) consistent with FLAG guidance. The screening meteorological data file utilizes each dispersion scenario considered in the EPA dispersion model known as "SCREEN3," blowing from each of 36 directions (every 10 degrees around the compass). Those wind directions match the directions to the model receptors.

For the near-field ISCST3 Dixie 20-well development scenario analyses used to evaluate the screening tables, Cedar City National Weather Service data was used along with one year of UDAQ-provided data during 2001 from the Sigurd Power Plant near Sigurd, as per the recommendation of UDAQ. For the Fishlake 12-well directional drilling scenario analyses, the same Sigurd meteorological data was used along with five years of UDAQ-provided and recommended data between 1997 to 2002 from PacifiCorp's Hunter Power Plant (Hunter) located outside Castle Dale. A discontinuity was found in the Hunter data set that limited the usable Hunter meteorological data files to three years and nine months from 1997 through late November of 2000. The Cedar City surface data was retrieved in SAMSON format along with associated upper air data and processed through the EPA PCRAMMET program consistent with UDAQ and EPA guidance.

Cedar City National Weather Service (NWS) data, the only data available in the project area with the extended parameters needed for visibility and/or deposition analyses, was used for all long-range transport analyses except the criteria pollutant concentration screening analyses and all AQRV analyses. Three years of Cedar City meteorological data, from 1988 to 1990, were used consistent with FLAG guidance. National Weather Service upper air meteorological data from Salt Lake City, the nearest and most representative site with available data, was used to complete the Cedar City modeling meteorological data files.

8.0 LAND USE CLASSIFICATION AND AREA PHYSICAL CHARACTERISTICS

Rural dispersion coefficients are assumed to be appropriate for all locations where project development is anticipated. Landforms across the CALPUFF modeling domain were judged to include primarily forested or barren land. Upon the recommendation of UDAQ, barren land parameters were used in CALPUFF, with slight adjustments in roughness, length, albedo (reflectiveness) and leaf index toward forested land to account for the vegetation in the higher elevations. CALPUFF plume elements were modeled as puffs. CALPUFF screening was prepared consistent with the "Guide for Applying the EPA Class 1 Screening Methodology with the CALPUFF Modeling System" prepared in 2001 by Joseph Scire of Earth-Tech, the developer of the CALPUFF modeling system. Mr. Scire and David Strimaitis, his current TRC Companies, Inc. partner and contributor to the development of the CALPUFF modeling system, provided comments and guidance on the CALPUFF modeling applications. No boundary influx was included in the CALPUFF analysis. The mean background ozone and ammonia concentrations used were specifically suggested by UDAQ and were consistent with recommend default values.

In other areas not discussed, ISCST3 defaults, including regulatory default options, were used, except for allowing for missing hours in non-NWS meteorological data files. CALPUFF Screening defaults recommended by FLAG and Interagency Workgroup on Air Quality Models (IWAQM) guidance or Mr. Scire or Strimaitis and/or incorporated in the ISC2PUFF translation program for ISCST3 input files were employed. Table 8.0-1 documents the values used in the modeling, post-processing, or data preparation.

Table 8.0-1 Proposed Physical Parameters for the Project Area

Parameter	Value
Min. Obukhov length (m)	10.0
Roughness length (m), met-data site	1.0
Roughness length (m), receptor network	0.20
Noon time albedo	0.30
Bowen ratio	5.0
Anthropogenic heat flux (W/m^2)	3.0
Fraction net radiation absorbed by ground	0.160
Mean monthly / annual ozone concentration (ppb)	80
Mean monthly / annual ammonia concentration (ppb)	10
Land use (CALPUFF)	Barren Land, with leaf index and roughness length adjusted slightly toward Forest Land
Leaf index	0.3
RURAL / URBAN	RURAL

9.0 MODELING RESULTS

9.1 Screening Modeling

The results of the screening modeling analyses were translated into a set of screening tables as described in the modeling protocol. The pollutant concentration screening runs were prepared using a screening meteorological data file. One-hour average maximum model predicted impacts were reported because the hourly data in those meteorological files was hypothetical; consecutive hours did not represent an actual time series. Therefore, processing the results of the screening air concentration modeling runs consisted of taking model predicted maximum one-hour average impacts and applying UDAQ recommended persistence factors to estimate model predicted impacts at averaging periods consistent with ambient air quality standards, increments and thresholds. Model output values from the CALPOST post-processing program associated with CALPUFF in that modeling system were copied directly into the screening and specific development scenario impact tables. The resulting screening tables conservatively estimate the maximum impact per pound per hour of emissions of criteria air pollutants at a variety of distances from the proposed activity and elevations differences between the activity area and receptor.

AQRV analyses (visibility impact and nitrogen and sulfur deposition) were performed with two or three years of measured met-data for each development scenario. Visibility impact analyses provided a quantative estimate of the increase of beta extinction for the specific development proposed, and site specific deposition analyses provide estimates of deposition rates. Site specific AQRV impact analyses confirm the reasonableness of deposition estimates from the screening analyses. The resulting AQRV impact predictions for each development scenario should represent a conservative estimate of the magnitude of impacts.

Model results from the specific development scenario runs were used to perform quality assurance checks on the screening table initially prepared from screening modeling results. As a result of those quality assurance checks, specific recommendations were made for applying the screening table entries for near field short term SO_2 concentrations (the reasoning behind those refinements is discussed in Section 9.1 of this report).

The intention in preparing these criteria pollutant impact screening table and AQRV analyses is to conservatively estimate the potential impact and confirm, through the specific development scenario model analyses, that the screening process would not underestimate the actual impacts. With that verification, the screening table results and AQRV impact analyses can be used to make an initial check on compliance with applicable impact limits. If screening impact estimates from a development action show compliance with applicable impact limits for all receptors, as long as that development action was planned consistent with the assumptions included in the screening analysis, it would not be expected to show any air quality impact concerns with a site and development specific air quality impact analysis. If screening impact estimates from a development action do not show compliance with applicable impact limits for all receptors, that development action cannot be justified by the screening analysis. That development action might require stronger emission control or mitigation conditions, or might be justified by a site and development specific air quality impact analysis (which would remove some of the conservatism inherent in the screening analysis).

Screening tables are presented in Appendix A for each parameter modeled: PM_{10}, NOx, SO_2, and visibility. The details of the specific development scenario model runs, analyses of results, and refinements made to the original screening tables as a result of those specific development scenario model runs are described below.

Each Appendix A table shows maximum predicted impacts at each receptor ring distance for each source / receptor elevation difference scenario. The impacts included in the tables are normalized, based upon one pound per hour emissions. The normalized impacts can be used to estimate the potential impact of various O&G development scenarios considered in either NF. Using the pound per hour emissions rate from any proposed project, the screening impact can be estimated by multiplying the screening table impact in Appendix A (in $\mu g/m^3$ per pound per hour emission) by the projected emission rate (in pounds per hour) for the project under consideration. The documentation clarifies that this is a screening tool for planning, leasing, and exploration estimates and conveys what level of development will require subsequent NEPA and/or air permitting action.

9.2 Specific Development Scenario Model Runs

As noted earlier, after the screening model runs, three potential development scenarios described by the Dixie and Fishlake NFs were modeled to assess concentrations of NOx, SO_2, and PM_{10}. The activity was set at arbitrarily chosen, conceivably developable locations on each NF. The locations were chosen based upon their O&G production potential, where such information was available; otherwise they were selected by air quality scientists as topographically representative sites where development could occur.

Receptors were placed in 22 rings around each of these development scenarios, at intervals consistent with the screening modeling receptors. Receptor elevations in the specific development scenario modeling used actual elevations from USGS digital elevation models. The primary goal was to estimate modeled impacts from the identified potential development scenario laid out in an area where it could conceivably occur. Another goal was to check if modeled impacts, at receptors set at actual locations in rings surrounding that development, were consistent with those predicted at those locations by the screening tables developed. As noted under the Model Receptor discussion, receptors were set assuming the outer edge of the developed area would be the ambient air boundary (the nearest location to which the public has access), which began at the fence of the central processing area.

Figures 5.1-1, 5.1-2, and 5.2-1 above show the layout of the model for the multi-well scenarios, and show the actual locations used for the specific development scenario modeling run analyses. Tables 4.4-1 and 4.5-1 above show the model source parameters used to simulate emissions from each scenario.

As noted under the meteorological data description, the specific development scenario model runs were made for the Dixie NF 20-well development scenario with one year of meteorological data from Sigurd (NW of the site monitored) and five years of data from Cedar City (representative of the central Dixie NF). The analytical verifications were performed by comparing the maximum model predicted impact at each receptor ring distance in the specific development scenario model analyses with maximum impacts predicted for that ring and receptor elevation from the screening tables developed for this project.

Similarly, verifications for the Fishlake NF 12-well drilling scenario were performed using one year of meteorological data from Sigurd (located in the south-central area of the Fishlake NF in the Sevier River canyon that channels flow locally) and the useable three years and nine months of data from the Hunter Power Plant (representative of the northeastern areas of the Fishlake NF).

For the above comparisons, the second maximum modeled impact from each meteorological data set was compared to the screening table result (see Appendix A) for the short term averaging periods (one day or less). The highest second maximum value in any year is the one compared against NAAQS standards for regulatory impact analyses. Model maximum impacts over the duration of the period modeled were used to verify longer term average impacts. This approach is conservative for the multi-year meteorological data files because the second maximum concentration over the duration of the period modeled would likely be higher than the second highest concentration in any individual year.

In regulatory air quality impact analyses, the first maximum impact, or increase in impacts, can be the value compared against incremental limit thresholds for major new sources or sources potentially affecting Class 1 airsheds. Because model receptors in the specific development scenario analyses were placed at actual elevations for the distance and orientation from the well field development scenario, the specific development scenario model runs results provided an opportunity to check the reasonableness of the values on the screening table.

These specific development scenario modeling runs were considered as a realistic test of potential maximum impacts from the scenarios modeled, even if the local wind patterns were not consistent with one of the meteorological data sets, since the results represent the conservative model predicted impacts from a variety of different wind flow patterns.

The goal of the verification process was to ensure that the screening tables produced conservative estimates of potential impacts (that they did not under predict impacts, which could result in problems if they were used for planning purposes), and that they were reasonable enough in estimating possible impacts to be potentially valuable planning tools.

“Model predicted maximum impacts” for each development scenario were prepared through the specific development scenario model runs described. For each meteorological data set modeled, the maximum impact for each pollutant and each regulatory averaging period was calculated at each receptor distance up to 40 kilometers. The actual elevations of the receptors where the maximum model predicted impact occurred were documented and the source / receptor elevation difference calculated. Those maximum predicted impacts at each receptor ring were compared to the impact value estimated from the screening tables for the source / receptor elevation difference. Mean source elevations were used for each development scenario, which included real world considerations of elevation variation across the well field. This data set provided quality assurance checks for a good percentage of the values on the screening table. Receptors lower than the source elevation showed up a little more than those with higher elevations than the source during the screening table verification process, mostly because the locations chosen for the specific development scenario model analyses had comparatively high elevations. There were still sufficient results to provide direct checks to almost half of the screening table results for receptors higher than the source elevation.

A representative section of the comparisons of the specific development scenario results with screening table results is included in Appendix B. Those verification analyses showed that the results from the screening table were quite conservative (overestimated values from specific development scenario analyses) for the closer receptors (especially those less than five miles from the development activity), for long range transport (receptors more than 30 kilometers from the development activity), and for the longer averaging periods. In the near field, this is because the screening runs had all emissions in one location, while actual field development spread the emissions (and hence impacts) over a larger footprint. This effect was minimized by starting the receptor network at the central processing area, and including the well fields in ambient air (accessible to public access). The screening scenario assumed very concentrated emissions that resulted in higher potential maximum impact predictions than those predicted from a well field scenario that spread activity over a few square miles. That concentration of emissions in the assumed model runs supporting the screening table would seem to be appropriate for individual wells, as in an isolated exploratory well. Nonetheless, it is potentially conservative when considering emissions spread over a well field.

UDAQ recommended an annual average persistence factor (conversion factor to estimate long term average impacts from short term maximum impacts) of 0.08 for simple terrain and 0.03 for complex terrain (multipliers of maximum predicted one hour average impact). The annual average impact persistence factor was set at 0.08 in these screening table results to be conservative. The use of a lower persistence factor for converting screening model predicted maximum one hour average model results (to estimate maximum annual average impacts) is probably justified for much of the Dixie NF because of the complex terrain, even though it is not used in this report.

9.3 Specific Development Scenario Model Results and Verification against Screening Table Estimates

Results for the 20-well conventional drilling and 12-well directional drilling development scenario runs indicated that impacts within 2½ miles of the well field perimeter and annual average impact predictions at all receptors rarely exceeded 30 percent of those predicted by the screening tables. Screening table results for those analyses proved conservative because they were never exceeded by development scenario analysis results. If the UDAQ recommended annual persistence factor of 0.03 for complex terrain were substituted for the 0.08 used in the tables, the screening table results would be lowered by 62.5%. Specific development scenario model runs would still show that the screening tables would be conservative even for the lower persistence factor UDAQ recommends for complex terrain.

As a result, we recommend that the distance from the source be measured only from the central fenced area where access is controlled, not the furthest extent of the well field development. We also recommend that some added conservatism could be removed by lowering the screening table annual average impact predictions by 62.5% in complex terrain.

The specific development scenario model run comparisons against screening table predicted impacts for more distant receptors, and for PM_{10} short term 24-hour averaging period at all receptors, showed the screening table values to be conservative (never under-predicting).

For SO_2 short term average impacts, verification efforts showed conservatism in the screening tables for receptors within five kilometers and beyond 50 kilometers. In the intermediate 5 – 50 km range, for receptors well above or well below the mean source elevation, a concern related to the concentration of the SO_2 emissions in a few sets of stack parameters in the screening model runs led to less conservative estimates from the screening tables. In a few cases, receptors well above or well below the model mean source base elevation had higher SO_2 impacts in the specific development scenario analyses than those estimated from the screening tables.

Diesel emissions, primarily from well pumps, represented the vast majority of SO_2 emissions. SO_2 was potentially exaggerated because the EPA AP-42 emission factor guidance for large diesel engines (including the drill rig engine) took into account lower sulfur content in available diesel fuel during the project operational phase, but the AP-42 emission factors for small diesel engines (used for the well pumps) did not (assuming 1996 fuel sulfur content). Because model SO_2 emissions were 99.5% concentrated in one set of model sources (the well pumps), the screening model results were dominated by the impacts of the well pumps.

Although screening model runs assume that all emissions occur at the same elevation, this rarely occurs in actual field locations in areas like the National Forests studied. As a result, the projections of the screening tables showed a plume narrowly concentrated with significant concentrations at nearby elevations but limited impacts at other elevations. Verification showed that the screening tables were conservative when applied using the elevation difference between the receptor and the well site with the closest elevation rather than the mean well field elevation. That method accounts for the actual difference between the receptor elevation and the elevation of a well pump plume. Therefore, to ensure conservatism (to make sure the screening table does not underestimate actual impacts), it is recommended that for short term SO_2, the elevation difference to reference in the screening tables should be the difference in elevation between the receptor and well nearest in elevation (rather than the mean well field elevation recommended for all other screening table applications).

Calculated statistics (shown in Appendix B) indicated that specific development scenario analysis SO_2 short term predictions for receptors at elevations higher or lower than the mean source elevation were, for three 3-hour averages and one 24-hour average, slightly higher than maximum impacts calculated from the screening tables. When the table was reinterpreted using the minimum elevation difference between the receptor and any project well pump instead of elevation difference between the receptor and the mean well field elevation, the screening table estimates of predicted impact never underestimated any impacts predicted in the specific development scenario analyses. Therefore, it is recommended to use the minimum elevation difference between the receptor and any project well rather than the elevation difference between the receptor and the mean well field elevation for short term SO_2 averaging period applications to ensure conservatism in applying the screening tables.

Further quality assurance identified inconsistencies in some variables across the transition from the near-field analyses prepared primarily using ISCST3 and the long-range transport analyses prepared using the CALPUFF model. Reviewers verified that there were inconsistencies across the 50km distance from the source where the recommended model changes from ISCST3 to CALPUFF. Those inconsistencies are more likely an indication of differences of model internal calculation methodology between ISCST3 and CALPUFF than anything likely to be noticed in the field. However, no adjustments were made to the initial screening results for this condition. While the inconsistencies in model predicted concentration trends noted are not likely to be observed in the field, the inconsistencies could occur when performing regulatory modeling, since they are a function of internal methodologies in the models that a permit applicant would be required to use during the regulatory process.

9.4 Screening Model Results Interpreted for US Forest Service Identified Potential Development Scenario Impacts

For each of the three potential development scenarios described in Section 2.0, the equipment assumed to be operating to support the scenario development is described here. Also, the screening table data is interpreted consistent with emissions from that equipment at anticipated operational levels to estimate maximum potential impacts. Those impact projections are conservative because they are based upon conservative emission source layout and dispersion conditions. The long term average impact projections are conservative because they are based upon short term emission rates that would likely be higher than those anticipated on an annual basis.

The visibility impact projections are considered to be conservative because the normalized runs featured low emission rates. Low rate normalized runs do not account for the depletion of ammonia or competition between nitrates and sulfates for ammonia that occur with higher emission rates. These scenarios represent the high end of potential impacts found in a refined air quality impact analysis, which are required for most development actions beyond initial exploration.

9.4.1 Scenario 1: Exploratory Drilling (Dixie and Fishlake National Forests)

This scenario is assumed to include the following activities that affect air quality:

- Construction of 5.5-acre drilling locations.
- A diesel fuel fired drill rig engine with emissions based upon 13.5 tons NOx per well reported in the Western Regional Air Partnership (WRAP) Oil & Gas Emission Inventory prepared in December 2005 by Environ and the 2005 Wyoming field survey from which that data was developed, with actual emissions adjusted downward to be compliant with recent tiered engine requirements, and SO_2 emissions consistent with AP-42 assuming the 15ppm sulfur content in diesel scheduled to be required during the operational phase.
    - The WRAP study indicated the mean drilling time is approximately 90 days per well, continuously around the clock except for maintenance. Therefore, the longer term average impact predictions effectively assume four wells drilled back to back in relatively close proximity to each other.
- Construction of 1.1 miles of new access roads.
- Support traffic to supply, maintain, and staff the drilling effort.
- A low volume of flaring of natural gas during exploration, equal to 100 Mscf per year.

Table 9.4-1 below documents the predicted criteria pollutant NO_2, SO_2, and PM_{10} concentration, nitrate and sulfate deposition, and visibility impairment impacts at a variety of distances for three elevation difference scenarios. A more complete set of tables featuring more elevation differences and more receptor rings are included in Appendix A.

Table 9.4-1 Screening Impacts Predicted with the Exploratory Drilling Scenario

Distance from Operating Area to Receptor (km)														
		1 (km)	2.5 (km)	5 (km)	10 (km)	15 (km)	20 (km)	30 (km)	40 (km)	50 (km)	70 (km)	100 (km)	140 (km)	200 (km)
Receptors 2500 feet above source														
NO_2	annual	4.42	1.11	0.38	0.13	0.07	0.04	0.03	0.02	0.05	0.01	0.01	0.01	0.01
SO_2	3 hour	0.07	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	24 hour	0.03	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	annual	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PM-10	24 hour	8.18	3.41	1.48	0.61	0.36	0.26	0.16	0.11	0.46	0.11	0.10	0.07	0.01
	annual	2.05	0.85	0.37	0.15	0.09	0.06	0.04	0.03	0.11	0.03	0.02	0.05	0.00
N Dep	kg/hect/yr	0.0356	0.0127	0.0056	0.0022	0.0012	0.0008	0.0004	0.0002	0.0001	0.0001	0.0000	0.0000	0.0000
S Dep	kg/hect/yr	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Visibility	Days Δdv >0.5	6	3	2	2	2	1	0	0	0	0	0	0	0
	Days Δdv >1.0	0	0	0	0	0	0	0	0	0	0	0	0	0
Receptors 500 feet above source														
NO_2	annual	7.59	2.27	0.90	0.35	0.20	0.14	0.08	0.06	0.05	0.01	0.01	0.00	0.00
SO_2	3 hour	0.08	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	24 hour		0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	annual	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PM-10	24 hour	10.44	4.06	1.73	0.71	0.42	0.30	0.18	0.13	0.46	0.21	0.10	0.07	0.01
	annual	2.61	1.01	0.43	0.18	0.10	0.07	0.05	0.03	0.11	0.05	0.02	0.02	0.00
N Dep	kg/hect/yr	0.0356	0.0127	0.0056	0.0022	0.0012	0.0008	0.0004	0.0002	0.0001	0.0000	0.0000	0.0000	0.0000
S Dep	kg/hect/yr	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Visibility	Days Δdv >0.5	6	3	2	2	2	1	0	0	0	0	0	0	0
	Days Δdv >1.0	0	0	0	0	0	0	0	0	0	0	0	0	0
Receptors at same elevation as source														
NO_2	annual	10.10	6.51	3.39	1.63	1.04	0.77	0.50	0.37	0.05	0.01	0.01	0.00	0.00
SO_2	3 hour	0.16	0.10	0.05	0.02	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
	24 hour	0.07	0.05	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	annual	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PM-10	24 hour	12.35	6.00	2.77	1.20	0.73	0.53	0.33	0.24	0.31	0.07	0.06	0.04	0.00
	annual	3.09	1.50	0.69	0.30	0.18	0.13	0.08	0.06	0.08	0.02	0.02	0.01	0.00
N Dep	kg/hect/yr	0.0262	0.0107	0.0050	0.0020	0.0011	0.0007	0.0003	0.0002	0.0001	0.0000	0.0000	0.0000	0.0000
S Dep	kg/hect/yr	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Visibility	Days Δdv >0.5	4	1	1	1	1	1	0	0	0	0	0	0	0
	Days Δdv >1.0	0	0	0	0	0	0	0	0	0	0	0	0	0

Receptors 1000 feet below source														
NO_2	annual	0.51	0.30	0.23	0.13	0.09	0.08	0.07	0.06	0.01	0.00	0.00	0.00	0.00
SO_2	3 hour	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	24 hour	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	annual	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PM-10	24 hour	8.18	3.41	1.48	0.61	0.36	0.26	0.16	0.11	0.01	0.00	0.00	0.00	0.00
	annual	2.05	0.85	0.37	0.15	0.09	0.06	0.04	0.03	0.00	0.00	0.00	0.00	0.00
N Dep	kg/hect/yr	0.0001	0.0002	0.0001	0.0001	0.0001	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
S Dep	kg/hect/yr	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Visibility	Days Δdv >0.5	0	0	0	0	0	0	0	0	0	0	0	0	0
	Days Δdv >1.0	0	0	0	0	0	0	0	0	0	0	0	0	0

Units for NOx, SO_2, and PM_{10} concentrations are µg/m^3

Screening table and model results show air quality impacts concentrated in the near proximity of an isolated exploratory well drilling operation. Visibility impacts potentially reach the FLAG 5% degradation level of concern out to 20 kilometers (12.4 miles) above which a cumulative impact analysis could be requested, and never reach the 10% visibility degradation FLAG recommends and Federal Land Managers (FLM) would likely oppose. Air concentrations of all pollutants fall below EPA defined significant impact levels by five kilometers (3.1 miles). Screening tables show that compliance with NAAQS would be assured with the background concentrations expected in potential development areas.

9.4.2 Scenario 2: 20-Well Conventional Drilling Development Consistent with the Dixie National Forest Development Scenario

This scenario is assumed to include the following activities that affect air quality:

- Construction of twenty 5.5-acre drilling locations.
- One diesel fuel fired drill rig engine with emissions based upon the 13.5 tons NOx per well reported in the WRAP Oil & Gas Emission Inventory prepared by Environ and the 2005 Wyoming field survey from which that data was developed, with actual emissions adjusted downward to be compliant with recent tiered engine requirements. SO_2 emissions are consistent with AP-42 assuming the 15ppm sulfur content in diesel scheduled to be required during the operational phase.
    - The WRAP study indicated the mean drilling time is approximately 90 days per well, continuously around the clock except for maintenance. Therefore, the longer term average impact predictions effectively assume four wells drilled back to back in relatively close proximity.
- Construction of eight miles of new access roads.
- Support traffic to supply, maintain, and staff the drilling and pumping effort.
- Twenty 0.5 MMbtu/hr heater / treater separators, two at each well pad.
- Twenty diesel powered 100 hp well pumps to extract oil, one for each well.
- One 1.0 MMbtu dehydrator and one 500 HP compressor processing a low volume of natural gas at partial capacity.

Diesel well pumps are assumed because the development sites are expected to be remote from the electric power grid. Though a slight amount of natural gas production is included, producible natural gas is not likely assumed by the USFS and is not anticipated in sufficient quantity to power the well pumps.

Table 9.4-2 documents the predicted criteria pollutant NO_2, SO_2, and PM_{10} concentration, nitrate and sulfate deposition, and visibility impairment impacts at a variety of distances for three elevation difference scenarios.

Table 9.4-2 Screening Impacts Predicted with the 20-Well Conventional Drilling Scenario

Distance From Operating Area to receptor (km)														
		1 (km)	2.5 (km)	5 (km)	10 (km)	15 (km)	20 (km)	30 (km)	40 (km)	50 (km)	70 (km)	100 (km)	140 (km)	200 (km)
Receptors 2500 feet above source														
NO_2	annual	13.04	3.28	1.12	0.38	0.20	0.13	0.07	0.05	0.15	0.04	0.02	0.01	0.00
SO_2	3 hour	27.62	6.41	2.12	0.70	0.37	0.24	0.14	0.10	0.19	0.04	0.02	0.01	0.00
	24 hour	12.28	9.38	4.88	2.17	1.33	0.95	0.60	0.48	0.11	0.02	0.01	0.01	0.00
	annual	3.07	0.71	0.24	0.08	0.04	0.03	0.02	0.01	0.03	0.01	0.00	0.00	0.00
PM-10	24 hour	16.57	6.90	3.00	1.24	0.74	0.52	0.32	0.23	0.92	0.43	0.20	0.14	0.00
	annual	4.14	1.73	0.75	0.31	0.18	0.13	0.08	0.06	0.23	0.11	0.05	0.03	0.00
N Dep	kg/hect/yr	0.1051	0.0375	0.0167	0.0065	0.0036	0.0023	0.0011	0.0006	0.0004	0.0002	0.0001	0.0000	0.0000
S Dep	kg/hect/yr	0.0383	0.0150	0.0059	0.0029	0.0017	0.0011	0.0005	0.0003	0.0002	0.0001	0.0000	0.0000	0.0000
Visibility	Days Δdv >0.5	82	75	73	60	49	40	27	15	10	4	2	1	0
	Days Δdv >1.0	49	43	40	31	25	18	6	3	2	0	0	0	0
Receptors 500 feet above source														
NO_2	annual	22.41	6.71	2.65	1.04	0.60	0.41	0.25	0.17	0.15	0.04	0.02	0.01	0.00
SO_2	3 hour	34.08	9.49	3.57	1.35	0.77	0.53	0.31	0.22	0.18	0.04	0.02	0.01	0.00
	24 hour	15.15	4.22	1.59	0.60	0.34	0.23	0.14	0.10	0.10	0.02	0.01	0.01	0.00
	annual	3.79	1.05	0.40	0.15	0.09	0.06	0.03	0.02	0.03	0.01	0.00	0.00	0.00
PM-10	24 hour	21.15	8.22	3.50	1.43	0.85	0.60	0.37	0.26	0.92	0.43	0.20	0.14	0.03
	annual	5.29	2.05	0.88	0.36	0.21	0.15	0.09	0.07	0.23	0.11	0.05	0.03	0.01
N Dep	kg/hect/yr	0.1051	0.0375	0.0167	0.0065	0.0036	0.0023	0.0011	0.0006	0.0004	0.0002	0.0001	0.0000	0.0000
S Dep	kg/hect/yr	0.0383	0.0150	0.0059	0.0029	0.0017	0.0011	0.0005	0.0003	0.0002	0.0001	0.0000	0.0000	0.0000
Visibility	Days Δdv >0.5	82	75	73	60	49	40	27	15	10	4	2	1	0
	Days Δdv >1.0	49	43	40	31	25	18	6	3	2	0	0	0	0

Receptors at same elevation as source														
NO_2	annual	29.83	19.21	10.01	4.80	3.08	2.27	1.47	1.09	0.14	0.04	0.02	0.01	0.00
SO_2	3 hour	67.92	44.37	22.15	10.03	6.19	4.46	2.80	2.03	0.18	0.04	0.02	0.01	0.00
	24 hour	30.19	19.72	9.84	4.46	2.75	1.98	1.24	0.90	0.10	0.02	0.01	0.01	0.00
	annual	7.55	4.93	2.46	1.11	0.69	0.50	0.31	0.23	0.03	0.01	0.00	0.00	0.00
PM-10	24 hour	25.01	12.16	5.62	2.44	1.49	1.06	0.67	0.48	0.62	0.15	0.13	0.09	0.03
	annual	6.25	3.04	1.40	0.61	0.37	0.27	0.17	0.12	0.16	0.04	0.03	0.02	0.01
N Dep	kg/hect/yr	0.0774	0.0315	0.0148	0.0059	0.0033	0.0022	0.0010	0.0006	0.0004	0.0001	0.0001	0.0000	0.0000
S Dep	kg/hect/yr	0.0314	0.0135	0.0055	0.0027	0.0016	0.0011	0.0004	0.0003	0.0002	0.0000	0.0000	0.0000	0.0000
Visibility	Days Δdv >0.5	77	69	70	57	47	38	25	14	9	3	2	1	0
	Days Δdv >1.0	46	39	37	31	23	17	5	2	1	0	0	0	0

Receptors 1000 feet below source														
NO_2	annual	1.50	0.88	0.67	0.38	0.27	0.23	0.20	0.16	0.02	0.01	0.01	0.01	0.00
SO_2	3 hour	2.78	1.62	1.23	0.71	0.49	0.41	0.37	0.30	0.05	0.01	0.01	0.01	0.00
	24 hour	1.24	0.72	0.55	0.31	0.22	0.18	0.16	0.14	0.03	0.01	0.00	0.00	0.00
	annual	0.31	0.18	0.14	0.08	0.05	0.05	0.04	0.03	0.01	0.00	0.00	0.00	0.00
PM-10	24 hour	16.57	6.90	3.00	1.24	0.74	0.52	0.32	0.23	0.02	0.01	0.01	0.00	0.00
	annual	4.14	1.73	0.75	0.31	0.18	0.13	0.08	0.06	0.00	0.00	0.00	0.00	0.00
N Dep	kg/hect/yr	0.0003	0.0005	0.0004	0.0002	0.0002	0.0002	0.0001	0.0001	0.0001	0.0001	0.0000	0.0000	0.0000
S Dep	kg/hect/yr	0.0004	0.0003	0.0002	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	0.0000	0.0000	0.0000	0.0000
Visibility	Days Δdv >0.5	5	6	5	6	4	5	3	3	2	2	2	0	0
	Days Δdv >1.0	1	1	1	1	1	1	1	0	0	0	0	0	0

Units for NOx, SO_2, and PM_{10} concentrations are μg/m^3

The results show potential increases in b_{ext} over the FLAG limit for Class I areas threshold of 10 percent out to almost 55 kilometers (34.2 miles), and over the FLAG level of concern of 0.5 deciviews (5% increase in b_{ext}) above which FLMs could request a cumulative visibility impact analysis out to 100 kilometers (62 miles). Potential deposition rates drop below FLAG screening thresholds of 0.005 kg/hect/year within 45 km (27.9 miles).

Criteria pollutant impacts conservatively estimated from the screening table are shown to approach but not exceed the NAAQS with anticipated background concentrations added in the immediate vicinity of development activity. Criteria pollutants are well below NAAQS within a few hundred kilometers and everywhere beyond. Air pollutant impacts are predicted to drop off to levels defined as insignificant in Class II areas within 41.5 km (25.8 miles) for NOx and in less than 13 km (8.1 miles) for all other pollutants. Compared against Class I area impact limits, criteria pollutant impacts are predicted to be insignificant within 60 kilometers (37.3 miles) for all pollutants. When predicted impacts are below Class I impact limits, cumulative incremental degradation impact analyses are not likely necessary. Therefore, this screening analysis cannot rule out the need to perform a cumulative impact analysis for criteria pollutants if Class I areas exist within 60 km (37.3 miles) of this type of development activity.

The conservatism in the screening tables is shown by the results of the verifications prepared from modeling runs for potential development operational scenarios. Specific development scenario modeling analyses with realistic layout of equipment in potentially sensible locations and representative meteorological data indicate low probability of exceeding NAAQS, increments and/or thresholds nearby, and show distances to those impact thresholds two to three times lower than predicted by the screening modeling. Using our assumed layout of equipment, locations, and regional meteorological data, the results indicate a low probability of exceeding ambient air quality standards, increments and/or thresholds.

The emission inventory for this analysis was conservative in that it assumed one new well was being drilled while the full field is operating, and also assumed that diesel pumps would be used at each well head. Predicted impacts would decrease by up to 20 percent if either no well drilling occurred simultaneously with the operation of the wells, or if enough natural gas was recovered onsite to fuel the well pumps. NOx, SO_2, and visibility impacts would be lowered significantly (SO_2 by 90 percent or more) if electric power lines brought power onsite and no fuel was needed to operate the well pumps.

9.4.3 Scenario 3: 12-Well Directional Drilling Development Consistent with the Fishlake National Forest Development Scenario

This scenario is assumed to include the following activities that affect air quality:

- Construction of three 5.5-acre drilling locations.
- One diesel fuel fired drill rig engine with emissions based upon the 13.5 tons NOx per well reported in the WRAP Oil & Gas Emission Inventory prepared by Environ and the 2005 Wyoming field survey from which that data was developed, with actual emissions adjusted downward to be compliant with recent tiered engine requirements, and SO_2 emissions consistent with AP-42 assuming the 15ppm sulfur content in diesel scheduled to be required during the project's operational phase.
    - The WRAP study indicated the mean drilling time is approximately 90 days per well, continuously around the clock except for maintenance. Therefore, the longer term average impact predictions effectively assume four wells drilled back to back in relatively close proximity.
- Construction of five miles of new access roads.
- Support traffic to supply, maintain, and staff the drilling and pumping effort.
- Six 1.0 MMbtu/hr heater / treater separators, two at each well pad.
- Twelve diesel powered 100 hp well pumps to extract oil, one for each well.
- One 0.5 MMbtu/hr dehydrator and one 500 HP compressor processing a low volume of natural gas at partial capacity.

Diesel well pumps are assumed because the development sites are expected to be remote from the electric power grid. Though a slight amount of natural gas production is included, producible natural gas is not routinely expected and is not anticipated in sufficient quantity to power the well pumps.

Table 9.4-3 on the following page documents the predicted criteria pollutant NO_2, SO_2, and PM_{10} concentration, nitrate and sulfate deposition, and visibility impairment impacts at a variety of distances for three elevation difference scenarios.

Table 9.4-3 Screening Impacts Predicted with the 12-Well Directional Drilling Scenario

		Distance From Operating Area to receptor (km)												
		1 (km)	2.5 (km)	5 (km)	10 (km)	15 (km)	20 (km)	30 (km)	40 (km)	50 (km)	70 (km)	100 (km)	140 (km)	200 (km)
Receptors 2500 feet above source														
NO_2	annual	10.29	2.59	0.88	0.30	0.16	0.10	0.06	0.04	0.12	0.03	0.02	0.01	0.00
SO_2	3 hour	16.60	3.85	1.27	0.42	0.22	0.14	0.08	0.06	0.11	0.02	0.01	0.01	0.00
	24 hour	7.38	5.63	2.93	1.30	0.80	0.57	0.36	0.29	0.07	0.01	0.01	0.00	0.00
	annual	1.84	0.43	0.14	0.05	0.02	0.02	0.01	0.01	0.02	0.00	0.00	0.00	0.00
PM-10	24 hour	12.76	5.31	2.31	0.95	0.57	0.40	0.25	0.18	0.71	0.33	0.15	0.10	0.00
	annual	3.19	1.33	0.58	0.24	0.14	0.10	0.06	0.04	0.18	0.08	0.04	0.03	0.00
N Dep	kg/hect/yr	0.0829	0.0296	0.0132	0.0051	0.0028	0.0018	0.0009	0.0005	0.0003	0.0001	0.0001	0.0000	0.0000
S Dep	kg/hect/yr	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Visibility	Days Δdv >0.5	24	21	23	26	23	17	11	7	3	1	0	0	0
	Days Δdv >1.0	6	6	7	8	7	4	1	0	0	0	0	0	0
Receptors 500 feet above source														
NO_2	annual	17.68	5.30	2.09	0.82	0.47	0.33	0.19	0.14	0.12	0.03	0.02	0.01	0.00
SO_2	3 hour	20.48	5.70	2.15	0.81	0.46	0.32	0.19	0.13	0.11	0.02	0.01	0.01	0.00
	24 hour	9.10	2.53	0.95	0.36	0.21	0.14	0.08	0.06	0.06	0.01	0.01	0.00	0.00
	annual	2.28	0.63	0.24	0.09	0.05	0.04	0.02	0.01	0.02	0.00	0.00	0.00	0.00
PM-10	24 hour	16.29	6.33	2.70	1.10	0.65	0.46	0.28	0.20	0.71	0.33	0.15	0.10	0.02
	annual	4.07	1.58	0.67	0.28	0.16	0.12	0.07	0.05	0.18	0.08	0.04	0.03	0.01
N Dep	kg/hect/yr	0.0829	0.0296	0.0132	0.0051	0.0028	0.0018	0.0009	0.0005	0.0003	0.0001	0.0001	0.0000	0.0000
S Dep	kg/hect/yr	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Visibility	Days Δdv >0.5	24	21	23	26	23	17	11	7	3	1	0	0	0
	Days Δdv >1.0	6	6	7	8	7	4	1	0	0	0	0	0	0
Receptors at same elevation as source														
NO_2	annual	23.54	15.16	7.90	3.79	2.43	1.79	1.16	0.86	0.11	0.03	0.01	0.01	0.00
SO_2	3 hour	40.81	26.66	13.31	6.02	3.72	2.68	1.68	1.22	0.11	0.02	0.01	0.01	0.00
	24 hour	18.14	11.85	5.91	2.68	1.65	1.19	0.75	0.54	0.06	0.01	0.01	0.00	0.00
	annual	4.53	2.96	1.48	0.67	0.41	0.30	0.19	0.14	0.02	0.00	0.00	0.00	0.00
PM-10	24 hour	19.26	9.37	4.32	1.88	1.14	0.82	0.51	0.37	0.48	0.11	0.10	0.07	0.00
	annual	4.81	2.34	1.08	0.47	0.29	0.21	0.13	0.09	0.12	0.03	0.03	0.02	0.00
N Dep	kg/hect/yr	0.0610	0.0248	0.0116	0.0047	0.0026	0.0017	0.0008	0.0005	0.0003	0.0001	0.0001	0.0000	0.0000
S Dep	kg/hect/yr	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Visibility	Days Δdv >0.5	23	20	22	23	20	16	9	6	2	1	0	0	0
	Days Δdv >1.0	6	6	7	7	6	4	1	0	0	0	0	0	0

Receptors 1000 feet below source														
NO_2	annual	1.19	0.69	0.52	0.30	0.21	0.18	0.16	0.13	0.02	0.01	0.01	0.00	0.00
SO_2	3 hour	1.67	0.97	0.74	0.43	0.30	0.25	0.22	0.18	0.03	0.01	0.00	0.00	0.00
	24 hour	0.74	0.43	0.33	0.19	0.13	0.11	0.10	0.08	0.02	0.00	0.00	0.00	0.00
	annual	0.19	0.11	0.08	0.05	0.03	0.03	0.02	0.02	0.00	0.00	0.00	0.00	0.00
PM-10	24 hour	12.76	5.31	2.31	0.95	0.57	0.40	0.25	0.18	0.01	0.01	0.00	0.00	0.00
	annual	3.19	1.33	0.58	0.24	0.14	0.10	0.06	0.04	0.00	0.00	0.00	0.00	0.00
N Dep	kg/hect/yr	0.0002	0.0004	0.0003	0.0002	0.0001	0.0001	0.0001	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000
S Dep	kg/hect/yr	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Visibility	Days Δdv >0.5	1	1	1	2	1	2	1	0	0	0	0	0	0
	Days Δdv >1.0	0	0	0	0	0	0	0	0	0	0	0	0	0

Units for NOx, SO_2, and PM_{10} concentrations are μg/m^3

The screening results show visibility degradation potentially reaching the FLAG level of concern of 0.5 deciviews (5% increase in b_{ext}) potentially requiring a cumulative visibility impact analysis out to 50 kilometers (31 miles), and reaching the FLAG suggested 1 deciview impact limit (10% increase in b_{ext}) out to 30 kilometers (18.6 miles). Deposition rates drop below FLAG screening thresholds of 0.005 kg/hect/year within 35 km (21.7 miles).

Criteria pollutant (NOx, SO_2, and PM_{10}) impacts conservatively estimated from the screening table are shown to approach but not exceed the NAAQS with anticipated background concentrations added in the immediate vicinity of development activity. However, impacts are estimated by screening to be well within NAAQS standards within a few hundred kilometers and everywhere beyond. Air pollutant impacts are predicted to drop off to levels defined as insignificant in Class II areas within 10 km (6.2 miles) for NOx and in less than 4 km (2.5 miles) for all other pollutants. Criteria pollutant impacts are conservatively predicted by screening to be insignificant compared against Class I area significance levels within 55 kilometers (34.1) miles) for NOx and 50 kilometers (31 miles) for all other pollutants. When predicted impacts are below Class I impact limits, impact analyses for cumulative incremental degradation are not likely necessary. Therefore, this screening analysis cannot rule out the need to perform a cumulative impact analysis for criteria pollutants if Class I areas exist within 55 km (34.1 miles).

The conservatism in the screening tables is shown by the results of the verifications prepared from modeling runs for potential development operational scenarios. Specific development scenario modeling analyses with realistic layout of equipment in potentially sensible locations and representative meteorological data indicate low probability of exceeding NAAQS, increments and/or thresholds nearby, and show distances to those impact thresholds two to three times lower than predicted by the screening modeling. These results assume reasonable dust control consistent with anticipated dust control efforts and requirements. The larger percentage differences from screening modeling estimates were generally for long term averaging periods and for the visibility analyses, where the screening assumptions were especially conservative. Specific development scenario modeling results show that actual development scenarios that do not pass the screening tests could be shown to have air quality impacts within acceptable limits with refined air quality modeling. The specific development scenario model analyses give only an indication of the extent to which impacts from refined modeling could be lower than those estimated from the screening tables.

The emission inventory for this analysis was conservative in that it assumed one new well was being drilled while the full field is operating, and also assumed that diesel pumps would be used at each well head. NOx, SO_2, and visibility impacts would decrease by approximately 20 percent if either no well drilling occurred simultaneously with the operation of 12-wells, or if enough natural gas was recovered onsite to fuel the well pumps. NOx, SO_2, and visibility impacts would be approximately 90 percent lower if electric power lines brought power onsite, and no fuel was needed to operate the well pumps.

9.5 Screening Table Summary

These estimates of potential impacts are based upon emission profiles consistent with the recommendations of the affected NFs, the US EPA, and the UDEQ, and with the NEPA analysis and associated requirements or mitigation measures defined in the EIS. These predicted distances to regulatory threshold impact limits are only for gauging if a more detailed analysis or a cumulative impact analysis should be considered. The model and screening tables can be used as in the examples given in Tables 9.4-2 and 9.4-3 to gauge the need for cumulative impact analysis.

9.5.1 Screening Table Values Do Not Under Predict Full Modeling values

In summary, the verification process described above and documented in Appendix B resulted in demonstrating that the results in the screening tables were conservative.

These analyses reveal that screening tables can be used to prepare conservative assessment of impacts of any specific action or alternative consistent with the assumptions included. Specific development scenario analyses confirm that when applied to representative potential development scenarios (consistent with the assumptions documented for the screening analysis), the screening tables do not under predict impacts predicted by site and project impact analyses

9.5.2 Elevation Difference for Sulfur Dioxide

There is, however, one caveat for short term average SO_2 impact estimates. For receptors at a distance of between 5 and 40 kilometers from the source, the elevation difference between the receptor and the source used in applying the screening tables should be based upon the elevation difference between the receptor and the well nearest in elevation to it rather than between the receptor location and the mean well field elevation.

9.5.3 Class I Cumulative Impact Analyses

The screening analysis for a single exploration well (Scenario 1), shows the need to perform a cumulative impact analysis for criteria pollutants if Class I areas exist within 3.1 miles of the drilling location.

The screening analysis for the Dixie NF “typical 20-well field” scenario (Scenario 2), using a set of reasonable assumptions, shows the need to perform a cumulative impact analysis for criteria pollutants if Class I areas exist within 37.3 miles

The screening analysis for the Fishlake NF “typical 12-well field” scenario (Scenario 3), using a set of reasonable assumptions, shows the need to perform a cumulative impact analysis for criteria pollutants if Class I areas exist within 34.1 miles.

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9.5.4 Visibility Analysis

The visibility analyses for the three development scenarios showed that isolated exploratory wells were not likely to have any significant impact. However, the development scenarios could have visibility impacts potentially reaching the FLAG limit of 1 deciview impact out to 35 kilometers (21.7 miles) for the Fishlake well development scenario and up to 55 kilometers (34.1 miles) for the Dixie NF well development scenario. Those analyses also indicate that the FLMs could request a cumulative visibility impact analysis for receptors out to 50 kilometers (31 miles) from the location for the Fishlake well development scenario and of 100 kilometers (62 miles) for the Dixie well development scenario.

Similarly, EPA FLAG recommended deposition impact thresholds for Class 1 areas could be reached out to from 21.7 kilometers (13.5 miles) for the Fishlake well development scenario and to 45 kilometers (27.9 miles) for the Dixie NF well development scenario. Those estimates are driven by the assumption of diesel well pumps. If natural gas could be recovered in sufficient quantity to power the well pumps, the extent of potential visibility and deposition impacts would drop, probably by at least one third, mainly due to sulfur deposition. If electric power was available, emissions of pollutants affecting visibility impacts would be considerably lower than those used for the visibility impact analyses reported here. Comparably lower deposition impacts could be estimated using the screening tables.

APPENDIX SIR-1A

Dixie and Fishlake National Forests Screening Tables for Prompt Initial Estimates of Likely Impacts from Oil and& Gas Development

PM-10

Receptor Elevation (ft) compared to Source Elevation

Receptor Elevation (ft) compared to Source Elevation	Distance from Operations to Receptor (km)										
	0.25	0.5	1	2.5	5	10	15	20	25	30	40
2500											
24hr ave (ug/m3)	20.129536	10.73376	7.024516	2.925596	1.2699	0.525316	0.312892	0.221672	0.169608	0.136356	0.09814
annual ave (ug/m3)	5.032384	2.68344	1.756129	0.731399	0.317475	0.131329	0.078223	0.055418	0.042402	0.034089	0.024535
1000											
24hr ave (ug/m3)	20.119304	12.759264	7.920324	3.18526	1.370592	0.564332	0.335312	0.237116	0.181164	0.145472	0.104492
annual ave (ug/m3)	5.029826	3.189816	1.980081	0.796315	0.342648	0.141083	0.083828	0.059279	0.045291	0.036368	0.026123
500											
24hr ave (ug/m3)	22.348028	15.1355	8.965812	3.483172	1.484748	0.60816	0.360388	0.254356	0.194048	0.155624	0.111556
annual ave (ug/m3)	5.587007	3.783875	2.241453	0.870793	0.371187	0.15204	0.090097	0.063589	0.048512	0.038906	0.027889
100											
24hr ave (ug/m3)	24.439884	16.322632	9.476412	3.644388	1.56142	0.648152	0.388748	0.276632	0.212532	0.17148	0.12396
annual ave (ug/m3)	6.109971	4.080658	2.369103	0.911097	0.390355	0.162038	0.097187	0.069158	0.053133	0.04287	0.03099
0											
24hr ave (ug/m3)	16.670336	12.944948	10.601604	5.155588	2.380732	1.03302	0.629584	0.45146	0.348652	0.282336	0.205104
annual ave (ug/m3)	4.167584	3.236237	2.650401	1.288897	0.595183	0.258255	0.157396	0.112865	0.087163	0.070584	0.051276
-1000											
24hr ave (ug/m3)	14.004428	10.73376	7.024516	2.925596	1.2699	0.525316	0.312892	0.221672	0.169608	0.13636	0.098148
annual ave (ug/m3)	3.501107	2.68344	1.756129	0.731399	0.317475	0.131329	0.078223	0.055418	0.042402	0.03409	0.024537
-2500											
24hr ave (ug/m3)	14.004428	10.733732	7.024516	2.925596	1.2699	0.525316	0.312892	0.221672	0.169608	0.136356	0.09814
annual ave (ug/m3)	3.501107	2.683433	1.756129	0.731399	0.317475	0.131329	0.078223	0.055418	0.042402	0.034089	0.024535

Receptor Elevation (ft) compared to Source Elevation

PM-10

Distance from Operations to Receptor (km)

	50	60	70	80	90	100	120	140	160	180	200
2500											
24hr ave (ug/m3)	0.390744	0.24864	0.180752	0.12906	0.11452	0.082772	0.066248	0.0572493	0.0330896	0.0015281	0.0011024
annual ave (ug/m3)	0.097686	0.06216	0.045188	0.032265	0.02863	0.020693	0.016562	0.0143123	0.0082724	0.000382	0.0002756
1000											
24hr ave (ug/m3)	0.390744	0.24864	0.180752	0.12906	0.11452	0.082772	0.066248	0.0572493	0.0330896	0.0015281	0.0110244
annual ave (ug/m3)	0.097686	0.06216	0.045188	0.032265	0.02863	0.020693	0.016562	0.0143123	0.0082724	0.000382	0.0027561
500											
24hr ave (ug/m3)	0.390744	0.24864	0.180752	0.12906	0.11452	0.082772	0.066248	0.0572493	0.0330896	0.0015281	0.0110244
annual ave (ug/m3)	0.097686	0.06216	0.045188	0.032265	0.02863	0.020693	0.016562	0.0143123	0.0082724	0.000382	0.0027561
100											
24hr ave (ug/m3)	0.390744	0.24864	0.180752	0.12906	0.11452	0.082772	0.066248	0.0572493	0.0330896	0.0015281	0.0110244
annual ave (ug/m3)	0.097686	0.06216	0.045188	0.032265	0.02863	0.020693	0.016562	0.0143123	0.0082724	0.000382	0.0027561
0											
24hr ave (ug/m3)	0.263264	0.167346	0.061536	0.086492	0.076632	0.055548	0.044306	0.0382787	0.0224308	0.0015277	0.0005234
annual ave (ug/m3)	0.065816	0.0418365	0.015384	0.021623	0.019158	0.013887	0.0110765	0.0095697	0.0056077	0.0003819	0.0001309
-1000											
24hr ave (ug/m3)	0.0064456	0.0055926	0.004234	0.0031652	0.0027644	0.0023777	0.0020894	0.001735	0.0025569	0.0013503	0.0012872
annual ave (ug/m3)	0.0016114	0.0013982	0.0010585	0.0007913	0.0006911	0.0005944	0.0005224	0.0004338	0.0006392	0.0003376	0.0003218
-2500											
24hr ave (ug/m3)	0.0064456	0.0054036	0.004234	0.0021736	0.001529	0.0012026	0.0013525	0.001556	0.0012819	0.0007228	0.0007328
annual ave (ug/m3)	0.0016114	0.0013509	0.0010585	0.0005434	0.0003822	0.0003006	0.0003381	0.000389	0.0003205	0.0001807	0.0001832

SO2

Receptor Elevation (ft) compared to Source Elevation	Distance from Operations to Receptor (km)										
	0.25	0.5	1	2.5	5	10	15	20	25	30	40
2500											
3hr ave (ug/m3)	52.429194	20.720880	6.706620	1.555578	0.513783	0.169767	0.090243	0.058140	0.042048	0.032859	0.023265
24hr ave (ug/m3)	23.301864	9.209280	2.980720	2.276573	1.185994	0.525834	0.322890	0.231814	0.179296	0.145424	0.116706
annual ave (ug/m3)	5.825466	2.302320	0.745180	0.172842	0.057087	0.018863	0.010027	0.006460	0.004672	0.003651	0.002585
dep(kg/hect/yr)	0.015008	0.015008	0.010123	0.005446	0.003082	0.001736	0.001280	0.000922	0.000719	0.000557	0.000375
1000											
3hr ave (ug/m3)	52.428699	20.720880	6.706620	1.555578	0.513783	0.169767	0.090243	0.058140	0.042345	0.033309	0.023265
24hr ave (ug/m3)	23.301644	9.209280	2.980720	0.691368	0.228348	0.075452	0.040108	0.025840	0.018820	0.014804	0.010340
annual ave (ug/m3)	5.825411	2.302320	0.745180	0.172842	0.057087	0.018863	0.010027	0.006460	0.004705	0.003701	0.002585
dep(kg/hect/yr)	0.015008	0.015008	0.010123	0.005446	0.003082	0.001736	0.001280	0.000922	0.000719	0.000557	0.000375
500											
3hr ave (ug/m3)	52.425153	20.720880	8.274897	2.303379	0.867852	0.328689	0.186921	0.128124	0.095544	0.075159	0.052209
24hr ave (ug/m3)	23.300068	9.209280	3.677732	1.023724	0.385712	0.146084	0.083076	0.056944	0.042464	0.033404	0.023204
annual ave (ug/m3)	5.825017	2.302320	0.919433	0.255931	0.096428	0.036521	0.020769	0.014236	0.010616	0.008351	0.005801
dep(kg/hect/yr)	0.015008	0.015008	0.010123	0.005446	0.003082	0.001736	0.001280	0.000922	0.000719	0.000557	0.000375
100											
3hr ave (ug/m3)	55.371627	27.454923	14.815665	6.133050	2.589858	1.047834	0.617418	0.423072	0.321336	0.256644	0.180027
24hr ave (ug/m3)	24.609612	12.202188	6.584740	2.725800	1.151048	0.465704	0.274408	0.188032	0.142816	0.114064	0.080012
annual ave (ug/m3)	6.152403	3.050547	1.646185	0.681450	0.287762	0.116426	0.068602	0.047008	0.035704	0.028516	0.020003
dep(kg/hect/yr)	0.015008	0.015008	0.010123	0.005446	0.003082	0.001736	0.001280	0.000922	0.000719	0.000557	0.000375
0											
3hr ave (ug/m3)	46.060353	28.021581	16.490871	10.772271	5.377005	2.434743	1.502847	1.082088	0.837414	0.678672	0.493056
24hr ave (ug/m3)	20.471268	12.454036	7.329276	4.787676	2.389780	1.082108	0.667932	0.480928	0.372184	0.301632	0.219136
annual ave (ug/m3)	5.117817	3.113509	1.832319	1.196919	0.597445	0.270527	0.166983	0.120232	0.093046	0.075408	0.054784
dep(kg/hect/yr)	0.015008	0.011088	0.006974	0.004178	0.002537	0.001359	0.001050	0.000785	0.000623	0.000493	0.000340
-1000											
3hr ave (ug/m3)	0.000333	1.172295	0.675477	0.393912	0.298530	0.171963	0.120024	0.099513	0.095958	0.088920	0.073872
24hr ave (ug/m3)	0.000148	0.521020	0.300212	0.175072	0.132680	0.076428	0.053344	0.044228	0.042648	0.039520	0.032832
annual ave (ug/m3)	0.000037	0.130255	0.075053	0.043768	0.033170	0.019107	0.013336	0.011057	0.010662	0.009880	0.008208
dep(kg/hect/yr)	0.015008	0.000081	0.000141	0.000189	0.000226	0.000160	0.000127	0.000112	0.000103	0.000098	0.000089
-2500											
3hr ave (ug/m3)	0.012672	1.172295	0.871812	0.582219	0.322758	0.203184	0.136800	0.100881	0.079659	0.065880	0.050751
24hr ave (ug/m3)	0.005632	0.521020	0.387472	0.258764	0.143448	0.090304	0.060800	0.044836	0.035404	0.029280	0.022556
annual ave (ug/m3)	0.001408	0.130255	0.096868	0.064691	0.035862	0.022576	0.015200	0.011209	0.008851	0.007320	0.005639
dep(kg/hect/yr)	0.015008	0.000052	0.000063	0.000079	0.000100	0.000100	0.000088	0.000074	0.000062	0.000054	0.000047

SO2

Distance from Operations to Receptor (km)

Receptor Elevation (ft) compared to Source Elevation

Receptor Elevation (ft)	50	60	70	80	90	100	120	140	160	180	200
2500											
3hr ave (ug/m3)	0.046282	0.018480	0.009997	0.008388	0.007515	0.004701	0.003426	0.002699	0.002356	0.001184	0.001097
24hr ave (ug/m3)	0.026447	0.010560	0.005712	0.004793	0.004294	0.002686	0.001958	0.001542	0.001346	0.000676	0.000627
annual ave (ug/m3)	0.006612	0.002640	0.001428	0.001198	0.001074	0.000672	0.000489	0.000386	0.000337	0.000169	0.000157
dep(kg/hect/yr)	0.000238	0.000173	0.000126	0.000094	0.000074	0.000063	0.000050	0.000041	0.000034	0.000029	0.000025
1000											
3hr ave (ug/m3)	0.046282	0.018480	0.009997	0.008388	0.007515	0.004701	0.003426	0.002699	0.002356	0.001184	0.001097
24hr ave (ug/m3)	0.026447	0.010560	0.005712	0.004793	0.004294	0.002686	0.001958	0.001542	0.001346	0.000676	0.000627
annual ave (ug/m3)	0.006612	0.002640	0.001428	0.001198	0.001074	0.000672	0.000489	0.000386	0.000337	0.000169	0.000157
dep(kg/hect/yr)	0.000259	0.000186	0.000135	0.000099	0.000075	0.000064	0.000050	0.000041	0.000035	0.000030	0.000026
500											
3hr ave (ug/m3)	0.043664	0.018360	0.009705	0.008217	0.007269	0.004607	0.003337	0.002657	0.002125	0.001165	0.001097
24hr ave (ug/m3)	0.024951	0.010491	0.005546	0.004696	0.004154	0.002632	0.001907	0.001518	0.001214	0.000666	0.000584
annual ave (ug/m3)	0.006238	0.002623	0.001386	0.001174	0.001038	0.000658	0.000477	0.000380	0.000304	0.000166	0.000161
dep(kg/hect/yr)	0.000259	0.000186	0.000135	0.000099	0.000075	0.000064	0.000050	0.000041	0.000035	0.000030	0.000026
100											
3hr ave (ug/m3)	0.043664	0.018360	0.009705	0.008217	0.007269	0.004607	0.003337	0.002657	0.002125	0.001165	0.001097
24hr ave (ug/m3)	0.024951	0.010491	0.005546	0.004696	0.004154	0.002632	0.001907	0.001518	0.001214	0.000666	0.000584
annual ave (ug/m3)	0.006238	0.002623	0.001386	0.001174	0.001038	0.000658	0.000477	0.000380	0.000304	0.000166	0.000161
dep(kg/hect/yr)	0.000259	0.000186	0.000135	0.000099	0.000075	0.000064	0.000050	0.000041	0.000035	0.000030	0.000026
0											
3hr ave (ug/m3)	0.043664	0.018360	0.009705	0.008217	0.007269	0.004607	0.003337	0.002657	0.002125	0.001165	0.001097
24hr ave (ug/m3)	0.024951	0.010491	0.005546	0.004696	0.004154	0.002632	0.001907	0.001518	0.001214	0.000666	0.000584
annual ave (ug/m3)	0.006238	0.002623	0.001386	0.001174	0.001038	0.000658	0.000477	0.000380	0.000304	0.000166	0.000161
dep(kg/hect/yr)	0.000259	0.000186	0.000135	0.000099	0.000075	0.000064	0.000050	0.000041	0.000035	0.000030	0.000026
-1000											
3hr ave (ug/m3)	0.011974	0.005435	0.003292	0.002451	0.002050	0.001762	0.001563	0.001311	0.001857	0.001021	0.000977
24hr ave (ug/m3)	0.006842	0.003106	0.001881	0.001401	0.001171	0.001007	0.000893	0.000749	0.001061	0.000584	0.000558
annual ave (ug/m3)	0.001711	0.000776	0.000470	0.000350	0.000293	0.000252	0.000223	0.000187	0.000265	0.000146	0.000140
dep(kg/hect/yr)	0.000079	0.000069	0.000062	0.000056	0.000050	0.000046	0.000039	0.000033	0.000029	0.000026	0.000023
-2500											
3hr ave (ug/m3)	0.004921	0.005435	0.003292	0.001776	0.001156	0.000935	0.001025	0.001179	0.000927	0.000541	0.000550
24hr ave (ug/m3)	0.002812	0.003106	0.001881	0.001015	0.000660	0.000534	0.000586	0.000673	0.000530	0.000309	0.000314
annual ave (ug/m3)	0.000703	0.000776	0.000470	0.000254	0.000165	0.000134	0.000146	0.000168	0.000132	0.000077	0.000079
dep(kg/hect/yr)	0.000041	0.000037	0.000034	0.000032	0.000030	0.000028	0.000024	0.000021	0.000019	0.000018	0.000017

Receptor Elevation (ft) compared to Source Elevation

NOx

	Distance from Operations to Receptor (km)										
	0.25	0.5	1	2.5	5	10	15	20	25	30	40
2500											
annual ave (ug/m3)	3.172979	1.289185	0.45462	0.114293	0.038994	0.013104	0.007007	0.004531	0.003285	0.002573	0.001825
dep(kg/hect/yr)	0.000017	0.090955	0.044116224	0.015461231	0.00672431	0.00237311	0.0012384	0.00078234	0.00051307	0.00036363	0.00020592
1000											
annual ave (ug/m3)	3.166254	1.289185	0.45462	0.120546	0.048103	0.019008	0.011025	0.007639	0.005741	0.004544	0.003184
dep(kg/hect/yr)	0.000017	0.09095493	0.044116224	0.015461231	0.00672431	0.00237311	0.0012384	0.00078234	0.000513	0.00036363	0.00020592
500											
annual ave (ug/m3)	3.486917	1.741156	0.781069	0.233967	0.09222	0.036134	0.020872	0.014424	0.01082	0.00855	0.005976
dep(kg/hect/yr)	0.000017	0.09095493	0.044116224	0.015461231	0.00672431	0.00237311	0.0012384	0.00078234	0.000513	0.00036363	0.00020592
100											
annual ave (ug/m3)	3.284705	1.747867	0.922212	0.408719	0.18475	0.080894	0.049954	0.035355	0.027371	0.022589	0.016917
dep(kg/hect/yr)	0.000017	0.09095493	0.044116224	0.015461231	0.00672431	0.00237311	0.0012384	0.00078234	0.000513	0.00036363	0.00020592
0											
annual ave (ug/m3)	2.67054	1.663214	1.039713	0.669593	0.348906	0.167308	0.107256	0.079021	0.062297	0.051275	0.038034
dep(kg/hect/yr)	0.000017	0.07579314	0.035281596	0.013872326	0.00626266	0.00225979	0.00118749	0.00075328	0.00049476	0.00035174	0.0001998
-1000											
annual ave (ug/m3)	0.057815	0.044312	0.052369	0.030632	0.023185	0.013284	0.009272	0.007863	0.007468	0.006871	0.005679
dep(kg/hect/yr)	0.000017	4.46443E-05	0.000117996	0.000218785	0.00014951	0.000085	0.000071	0.000067	0.000061	0.000055	0.000045
-2500											
annual ave (ug/m3)	0.057815	0.079422	0.060759	0.045244	0.0248	0.019429	0.014012	0.010856	0.008891	0.00756	0.005868
dep(kg/hect/yr)	0.000017	0.000017	0.000033	0.000037	0.000050	0.000036	0.000029	0.000024	0.000022	0.000021	0.000019

Receptor Elevation (ft) compared to Source Elevation

NOx	Distance from Operations to Receptor (km)										
	50	60	70	80	90	100	120	140	160	180	200
2500											
annual ave (ug/m3)	0.0051342	0.0029421	0.0012732	0.0011128	0.00093333	0.00072414	0.00065569	0.00040637	0.0002535	0.00016235	0.00010215
dep(kg/hect/yr)	0.000124886	0.000079	0.000052	0.000036	0.000030	0.000026	0.000020	0.000016	0.000013	0.000011	0.000010
1000											
annual ave (ug/m3)	0.0051342	0.0029421	0.0012732	0.0011128	0.00093333	0.00072414	0.00065569	0.00040637	0.0002535	0.00016235	0.00010215
dep(kg/hect/yr)	0.000124886	0.000079	0.000052	0.000036	0.000030	0.000026	0.000020	0.000016	0.000013	0.000011	0.000010
500											
annual ave (ug/m3)	0.0051342	0.0029421	0.0012732	0.0011128	0.00093333	0.00072414	0.00065569	0.00040637	0.0002535	0.00016235	0.00010215
dep(kg/hect/yr)	0.000124886	0.000079	0.000052	0.000036	0.000030	0.000026	0.000020	0.000016	0.000013	0.000011	0.000010
100											
annual ave (ug/m3)	0.0051342	0.0029421	0.0012732	0.0011128	0.00093333	0.00072414	0.00065569	0.00040637	0.0002535	0.00016235	0.00010215
dep(kg/hect/yr)	0.000124886	0.000079	0.000052	0.000036	0.000030	0.000026	0.000020	0.000016	0.000013	0.000011	0.000010
0											
annual ave (ug/m3)	0.0048582	0.0025029	0.0012482	0.0010898	0.00091722	0.00060981	0.00046478	0.00028405	0.00024689	0.00016209	0.00015462
dep(kg/hect/yr)	0.000121	0.000077	0.000051	0.000036	0.000030	0.000025	0.000019	0.000016	0.000013	0.000011	0.000009
-1000											
annual ave (ug/m3)	0.0006946	0.00066168	0.00049089	0.00033354	0.00026393	0.00023069	0.00020763	0.000179	0.00018261	0.00013937	0.00013397
dep(kg/hect/yr)	0.000038	0.000032	0.000028	0.000025	0.000022	0.000020	0.000016	0.000014	0.000012	0.000010	0.000009
-2500											
annual ave (ug/m3)	0.0006946	0.00066168	0.00049089	0.00033354	0.00021519	0.00017726	0.00014484	0.00015269	0.00012695	8.9795E-05	7.3072E-05
dep(kg/hect/yr)	0.000017	0.000016	0.000014	0.000012	0.000011	0.000011	0.000010	0.000009	0.000008	0.000007	0.000007

APPENDIX SIR-1B

Dixie and Fishlake National Forests Statistics

Comparing Verification Run Results With

Initial Screening Table Results

Dixie NF 20 Well Drilling Scenario

NO2 Verification Annual Average: Refined Modeling Results vs. Screening Table

Cedar City met. data	2nd max over 5 years	NO2 annual average refined model predicted impact	A pred impact per lb/hr emission		source receptor elev diff	B scr table results for src/red ht diff	(A-B)/B
		ug/m3	/lb/hr	elev	del ht	Scr table	% dif
	0.25	9.8431	0.343084699	9566.9	146.9	3.284705	-89.6%
	0.5	10.58238	0.368852562	9567.9	147.9	1.747867	-78.9%
	1	6.76497	0.235795399	9490.2	70.2	0.922212	-74.4%
	2.5	1.94944	0.067948414	9560.4	140.4	0.408719	-83.4%
	5	0.84572	0.029477867	9511.8	91.8	0.18475	-84.0%
	10	0.25096	0.008747299	9482.9	62.9	0.080894	-89.2%
	15	0.10233	0.003566748	9331.0	-89.0	0.049954	-92.9%
	20	0.07949	0.002770652	9342.8	-77.2	0.079021	-96.5%
	25	0.07265	0.002532241	9399.6	-20.4	0.062297	-95.9%
	30	0.05862	0.002043221	9697.2	277.2	0.022589	-91.0%
	40	0.00966	0.000336703	7982.6	-1437.4	0.005679	-94.1%

Sigurd met. data	2nd max over 1 year	ug/m3	/lb/hr	elev	del ht	Scr Tab	%diff
	0.25	16.96058	0.591166957	9545.3	125.3	3.284705	-82.0%
	0.5	13.33981	0.46496375	9567.9	147.9	1.747867	-73.4%
	1	12.21057	0.425603695	9531.2	111.2	0.922212	-53.8%
	2.5	3.76716	0.131305681	9684.4	264.4	0.408719	-67.9%
	5	1.77419	0.061840014	9562.3	142.3	0.18475	-66.5%
	10	0.82065	0.028604043	9482.9	62.9	0.080894	-64.6%
	15	0.33588	0.011707215	9610.9	190.9	0.049954	-76.6%
	20	0.20432	0.007121645	9533.8	113.8	0.035355	-79.9%
	25	0.11849	0.00413001	9445.5	25.5	0.062297	-93.4%
	30	0.16216	0.005652144	9528.9	108.9	0.022589	-75.0%
	40	0.02505	0.000873127	9190.9	-229.1	0.038034	-97.7%

negative % diff shows screening tables predictions are conservatively high as compared to verification analyses

Dixie NF 20 Well Drilling Scenario

PM-10 24 hour Average Verification: Refined Modeling Results vs. Screening Table

Cedar City met. data	2nd max over 5 years	PM-10 24 hour average					
		refined model predicted impact	**A** pred impact per lb/hr emission		source receptor elev diff	**B** scr table results for src/red ht diff	(A-B)/B
		ug/m3	**/lb/hr**	**elev**	**del ht**	**Scr Tab**	**%diff**
	0.25	3.22152	1.365050847	9508.2	88.2	24.43988	-94.4%
	0.5	2.62721	1.113224576	9567.9	147.9	16.32263	-93.2%
	1	1.92472	0.815559322	9531.2	111.2	9.476412	-91.4%
	2.5	0.74613	0.31615678	9487.9	67.9	3.644388	-91.3%
	5	0.40585	0.171970339	9447.2	27.2	2.380732	-92.8%
	10	0.17673	0.074885593	9482.9	62.9	0.648152	-88.4%
	15	0.10558	0.044737288	9331.0	-89.0	0.629584	-92.9%
	20	0.09035	0.038283898	9342.8	-77.2	0.45146	-91.5%
	25	0.07044	0.029847458	6437.0	-2983.0	0.169608	-82.4%
	30	0.0622	0.026355932	7654.9	-1765.1	0.136356	-80.7%
	40	0.04966	0.021042373	7851.4	-1568.6	0.098148	-78.6%

Sigurd met. data	2nd max over 1 year	ug/m3	/lb/hr	elev	del ht	Scr Tab	%diff
	0.25	5.25581	2.227038136	9564.6	144.6	24.43988	-90.9%
	0.5	3.88428	1.645881356	9567.9	147.9	16.32263	-89.9%
	1	3.52142	1.492127119	9531.2	111.2	9.476412	-84.3%
	2.5	1.21486	0.514771186	9668.3	248.3	3.644388	-85.9%
	5	0.66231	0.280639831	9511.8	91.8	1.56142	-82.0%
	10	0.34464	0.146033898	9320.9	-99.1	1.03302	-85.9%
	15	0.25026	0.106042373	9122.0	-298.0	0.629584	-83.2%
	20	0.1824	0.077288136	8871.7	-548.3	0.221672	-65.1%
	25	0.14563	0.061707627	8363.5	-1056.5	0.169608	-63.6%
	30	0.12743	0.053995763	7857.3	-1562.7	0.13636	-60.4%
	40	0.09531	0.040385593	6952.4	-2467.6	0.09814	-58.8%

negative % diff shows screening tables predictions are conservatively high as compared to verification analyses

Dixie NF 20 Well Drilling Scenario

PM-10 Annual Average Verification: Refined Modeling Results vs. Screening Table

Cedar City met. data	2nd max over 5 years	PM-10 annual average					
		refined model predicted impact	**A** pred impact per lb/hr emission		source receptor elev diff	**B** scr table results for src/red ht diff	(A-B)/B
		ug/m3	**/lb/hr**	**elev**	**del ht**	**Scr Tab**	**%diff**
	0.25						
	0.5	2.71	1.148305085	9586.7	166.7	5.389365	-78.7%
	1	1.81	0.766949153	9636.2	216.2	3.500076	-78.1%
	2.5	0.82991	0.35165678	9490.2	70.2	1.450883	-75.8%
	5	0.39448	0.167152542	9475.4	55.4	0.629172	-73.4%
	10	0.19076	0.080830508	9396.0	-24	0.260148	-68.9%
	15	0.0784	0.033220339	9310.4	-109.6	0.154907	-78.6%
	20	0.0559	0.023686441	9299.2	-120.8	0.109719	-78.4%
	25	0.05772	0.024457627	9555.1	135.1	0.083933	-70.9%
	30	0.04682	0.019838983	9523.0	103	0.067466	-70.6%
	40	0.03537	0.014987288	9821.5	401.5	0.049028	-69.4%
Sigurd met. data	2nd max over 1 year	**ug/m3**	**/lb/hr**	**elev**	**del ht**	**Scr Tab**	**%diff**
	0.25	1.96332	0.831915254	9564.6	144.6	5.389365	-84.6%
	0.5	1.68205	0.712733051	9567.9	147.9	3.500076	-79.6%
	1	1.2175	0.515889831	9531.2	111.2	1.450883	-64.4%
	2.5	0.34604	0.146627119	9684.4	264.4	0.629172	-76.7%
	5	0.15586	0.066042373	9613.8	193.8	1.56142	-95.8%
	10	0.06891	0.029199153	9482.9	62.9	0.648152	-95.5%
	15	0.0319	0.013516949	9415.0	-5.0	0.629584	-97.9%
	20	0.01713	0.007258475	9411.7	-8.3	0.45146	-98.4%
	25	0.01113	0.004716102	9445.5	25.5	0.348652	-98.6%
	30	0.01293	0.005478814	9528.9	108.9	0.17148	-96.8%
	40	0.00366	0.001550847	6952.4	-2467.6	0.09814	-98.4%

negative % diff shows screening tables predictions are conservatively high as compared to verification analyses

Dixe NF 20 Well Drilling Scenario

SO2 3 hour Average Verification: Refined Modeling Results vs. Screening Table

Cedar City met. data	2nd max over 5 years	SO2 3 hour average					
		refined model predicted impact	**A** pred impact per lb/hr emission		source receptor elev diff	**B** scr table results for src/red ht diff	(A-B)/B
		ug/m3	**/lb/hr**	**elev**	**del ht**	**Scr Tab**	**%diff**
	0.25	16.45	3.992718447	9398.0	-22.0	46.060353	-91.3%
	0.5	16.673	4.04684466	9564.0	144.0	27.4549	-85.3%
	1	16.211	3.934708738	9531.2	111.2	14.8157	-73.4%
	2.5	4.9243	1.195218447	9682.1	262.1	2.3034	-48.1%
	5	3.182	0.772330097	10206.4	786.4	0.867852	-11.0%
	10	1.7232	0.418252427	10257.2	837.2	0.3287	27.2%
	15	0.9838	0.238786408	9948.5	528.5	0.1869	27.7%
	20	0.63558	0.15426699	9342.8	-77.2	1.0821	-85.7%
	25	0.42098	0.102179612	9399.6	-20.4	0.837414	-87.8%
	30	0.29997	0.072808252	9697.2	277.2	0.2566	-71.6%
	40	0.16323	0.039618932	7365.2	-2054.8	0.0508	-21.9%
Sigurd met. data	2nd max over 1 year	**ug/m3**	**/lb/hr**	**elev**	**del ht**	**Scr Tab**	**%diff**
	0.25	16.059	3.897815534	9386.2	-33.8	46.060353	-91.5%
	0.5	18.793	4.561407767	9564.0	144.0	27.4549	-83.4%
	1	19.243	4.670631068	9531.2	111.2	14.8157	-68.5%
	2.5	7.5264	1.826796117	9760.2	340.2	2.3034	-20.7%
	5	4.9081	1.191286408	9697.2	277.2	2.5899	-54.0%
	10	3.2921	0.799053398	9676.2	256.2	1.0478	-23.7%
	15	1.7188	0.417184466	9415.0	-5.0	1.5028	-72.2%
	20	1.1983	0.290849515	9411.7	-8.3	1.0821	-73.1%
	25	0.43614	0.105859223	7302.5	-2117.5	0.0797	32.9%
	30	0.43194	0.104839806	9528.9	108.9	0.2566	-59.1%
	40	0.22018	0.053441748	7769.7	-1650.3	0.0739	-27.7%

negative % diff shows screening tables predictions are conservatively high as compared to verification analyses

Dixe NF 20 Well Drilling Scenario

SO2 24 hour Average Verification: Refined Modeling Results vs. Screening Table

Cedar City met. data	2nd max over 5 years	SO2 24 hour average					
		refined model predicted impact	**A** pred impact per lb/hr emission		source receptor elev diff	**B** scr table results for src/red ht diff	(A-B)/B
		ug/m3	**/lb/hr**	**elev**	**del ht**	**Scr Tab**	**%diff**
	0.25	5.18	1.257281553	9387.5	-32.5	20.47127	-93.9%
	0.5	5.3597	1.300898058	9567.9	147.9	12.202188	-89.3%
	1	6.1717	1.497985437	9531.2	111.2	6.58474	-77.3%
	2.5	1.2352	0.299805825	9560.4	140.4	2.7258	-89.0%
	5	0.81505	0.19782767	9447.2	27.2	2.38978	-91.7%
	10	0.35351	0.085803398	9806.4	386.4	0.146084	-41.3%
	15	0.20126	0.048849515	10245.1	825.1	0.040108	21.8%
	20	0.1367	0.033179612	9342.8	-77.2	0.480928	-93.1%
	25	0.086177	0.020916748	9399.6	-20.4	0.372184	-94.4%
	30	0.073134	0.017750971	9697.2	277.2	0.114064	-84.4%
	40	0.03772	0.00915534	7056.1	-2363.9	0.022556	-59.4%

Sigurd met. data	2nd max over 1 year	ug/m3	/lb/hr	elev	del ht	Scr Tab	%diff
	0.25	4.7554	1.154223301	9386.2	-33.8	20.47127	-94.4%
	0.5	6.4729	1.571092233	9567.9	147.9	12.202188	-87.1%
	1	6.1576	1.494563107	9531.2	111.2	6.58474	-77.3%
	2.5	2.5361	0.615558252	9668.3	248.3	2.7258	-77.4%
	5	1.3122	0.318495146	9613.5	193.5	1.151048	-72.3%
	10	0.65085	0.157973301	9482.9	62.9	0.465704	-66.1%
	15	0.39608	0.096135922	9610.9	190.9	0.274408	-65.0%
	20	0.1816	0.04407767	9411.7	-8.3	0.480928	-90.8%
	25	0.11062	0.026849515	7473.4	-1946.6	0.05268	-49.0%
	30	0.081532	0.01978932	9528.9	108.9	0.114064	-82.7%
	40	0.062753	0.015231311	7591.2	-1828.8	0.022556	-32.5%

negative % diff shows screening tables predictions are conservatively high as compared to verification analyses

Dixe NF 20 Well Drilling Scenario

SO2 Annual Average Verification: Refined Modeling Results vs. Screening Table

Cedar City met. data	2nd max over 5 years	SO2 annual average					
		refined model predicted impact	**A** pred impact per lb/hr emission		source receptor elev diff	**B** scr table results for src/red ht diff	(A-B)/B
		ug/m3	**/lb/hr**	**elev**	**del ht**	**Scr Tab**	**%diff**
	0.25	1.36203	0.330589806	9386.2	-33.8	5.117817	-93.5%
	0.5	1.95213	0.473817961	9567.9	147.9	3.050547	-84.5%
	1	1.30358	0.316402913	9490.2	70.2	1.646185	-80.8%
	2.5	0.33406	0.081082524	9560.4	140.4	0.68145	-88.1%
	5	0.12932	0.03138835	9511.8	91.8	0.287762	-89.1%
	10	0.03607	0.008754854	9482.9	62.9	0.116426	-92.5%
	15	0.01785	0.004332524	9331.0	-89.0	0.166983	-97.4%
	20	0.01356	0.003291262	9342.8	-77.2	0.120232	-97.3%
	25	0.01253	0.003041262	9399.6	-20.4	0.093046	-96.7%
	30	0.00892	0.002165049	9697.2	277.2	0.028516	-92.4%
	40	0.00163	0.000395631	7982.6	-1437.4	0.008208	-95.2%
Sigurd met. data	2nd max over 1 year	**ug/m3**	**/lb/hr**	**elev**	**del ht**	**Scr Tab**	**%diff**
	0.25						
	0.5	1.36	0.330097087	9719.2	299.2	2.079332	-84.1%
	1	0.97159	0.235822816	9742.1	322.1	0.880569	-73.2%
	2.5	0.58605	0.142245146	9608.3	188.3	4.344336	-96.7%
	5	0.34898	0.084703883	9536.6	116.6	0.541491	-84.4%
	10	0.14926	0.036228155	9536.4	116.4	0.245899	-85.3%
	15	0.07499	0.018201456	9599.4	179.4	0.152399	-88.1%
	20	0.03263	0.007919903	9482.9	62.9	0.110078	-92.8%
	25	0.02219	0.005385922	9555.1	135.1	0.085433	-93.7%
	30	0.01805	0.004381068	9523.0	103.0	0.069418	-93.7%
	40	0.00846	0.002053398	9962.6	542.6	0.005807	-64.6%

negative % diff shows screening tables predictions are conservatively high as compared to verification analyses

Fishlake NF 12 Well Drilling Scenario

NO2 Annual Average Verification: Refined Modeling Results vs. Screening Table

Hunter met. data	2nd max over 5 years	NO2 refined model predicted impact ug/m3	A pred impact per lb/hr emission /lb/hr	elev	source receptor elev diff del ht	B scr table results for src/red ht diff Scr table	(A-B)/B % dif
	0.5	3.74457	0.165417444	8232.3	33.2	1.663214	-90.1%
	1	1.35899	0.06003377	8175.7	-23.4	1.039713	-94.2%
	2.5	0.73904	0.032647302	8146.6	-52.5	0.669593	-95.1%
	5	0.31294	0.013824213	8119.6	-79.5	0.348906	-96.0%
	10	0.08239	0.003639602	7889.3	-309.8	0.167308	-97.8%
	15	0.16516	0.00729599	8482.3	283.2	0.049954	-85.4%
	20	0.11555	0.005104454	8367.9	168.8	0.035355	-85.6%
	25	0.08655	0.003823371	7969.9	-229.2	0.062297	-93.9%
	30	0.07715	0.003408123	7750.4	-448.7	0.051275	-93.4%
	40	0.06694	0.002957094	7808.4	-390.7	0.038034	-92.2%

Sigurd met. data	2nd max over 1 year	ug/m3	/lb/hr	elev	del ht	Scr Tab	%diff
	0.5	4.78104	0.211203801	8251.6	52.5	1.747867	-87.9%
	1	3.6615	0.161747803	8284.9	85.8	0.922212	-82.5%
	2.5	1.78453	0.07883212	8345.1	146	0.408719	-80.7%
	5	0.79307	0.035034093	8473.1	274	0.18475	-81.0%
	10	0.17741	0.007837137	8064	-135.1	0.167308	-95.3%
	15	0.26046	0.011505895	7951	-248.1	0.107256	-89.3%
	20	0.25778	0.011387505	8015.2	-183.9	0.079021	-85.6%
	25	0.14316	0.006324134	8503.6	304.5	0.01082	-41.6%
	30	0.09354	0.004132156	8070.9	-128.2	0.051275	-91.9%
	40	0.09609	0.004244803	8467.6	268.5	0.016917	-74.9%

negative % diff shows screening tables predictions are conservatively high as compared to verification analyses

Fishlake NF 12 Well Drilling Scenario

PM-10 24 hour Average Verification: Refined Modeling Results vs. Screening Table

		PM-10 24 hour average					
Hunter met. data	2nd max over 5 years	refined model predicted impact	**A** pred impact per lb/hr emission		source receptor elev diff	**B** scr table results for src/red ht diff	(A-B)/B
		ug/m3	**/lb/hr**	**elev**	**del ht**	**Scr Tab**	**%diff**
	0.5	1.49482	0.604096648	8326.8	127.7	16.322632	-96.3%
	1	1.01863	0.411655563	8141.1	-58	10.601604	-96.1%
	2.5	0.57499	0.232368801	8216	16.9	5.155588	-95.5%
	5	0.36337	0.146847513	8074.7	-124.4	2.380732	-93.8%
	10	0.29139	0.117758474	7889.3	-309.8	1.03302	-88.6%
	15	0.26289	0.106240864	8482.3	283.2	0.388748	-72.7%
	20	0.20166	0.081496187	8367.9	168.8	0.276632	-70.5%
	25	0.19624	0.07930582	8408.5	209.4	0.212532	-62.7%
	30	0.15954	0.064474371	7750.4	-448.7	0.282336	-77.2%
	40	0.13123	0.053033545	7808.4	-390.7	0.205104	-74.1%
Sigurd met. data	2nd max over 1 year	**ug/m3**	**/lb/hr**	**elev**	**del ht**	**Scr Tab**	**%diff**
	0.5	1.58985	0.642500807	8699.8	500.7	15.1355	-95.8%
	1	1.04858	0.423759157	8296.9	97.8	9.476412	-95.5%
	2.5	0.65056	0.262908655	8345.1	146	3.644388	-92.8%
	5	0.40528	0.163784462	8473.1	274	1.56142	-89.5%
	10	0.27389	0.110686257	8130.8	-68.3	1.03302	-89.3%
	15	0.16665	0.067347712	8004.2	-194.9	0.629584	-89.3%
	20	0.13258	0.053579116	8015.2	-183.9	0.45146	-88.1%
	25	0.12409	0.05014808	7914.5	-284.6	0.348652	-85.6%
	30	0.10305	0.041645255	7818.3	-380.8	0.282336	-85.2%
	40	0.07306	0.029525495	7933.3	-265.8	0.205104	-85.6%

negative % diff shows screening tables predictions are conservatively high as compared to verification analyses

Fishlake NF 12 Well Drilling Scenario

PM-10 Annual Average Verification: Refined Modeling Results vs. Screening Table

Hunter met. data	2nd max over 5 years	PM-10 annual average refined model predicted impact ug/m3	A pred impact per lb/hr emission /lb/hr	elev	source receptor elev diff del ht	B scr table results for src/red ht diff Scr Tab	(A-B)/B %diff
	0.5	0.37387	0.151090843	8326.8	127.7	4.080658	-0.96297
	1	0.18559	0.075001871	8141.1	-58	2.650401	-97.2%
	2.5	0.06265	0.025318537	8216	16.9	1.288897	-98.0%
	5	0.02977	0.012030851	8074.7	-124.4	0.595183	-98.0%
	10	0.00822	0.003321921	7889.3	-309.8	0.258255	-98.7%
	15	0.01569	0.006340748	8482.3	283.2	0.097187	-93.5%
	20	0.01076	0.004348403	8367.9	168.8	0.069158	-93.7%
	25	0.00869	0.003511861	8408.5	209.4	0.053133	-93.4%
	30	0.00732	0.002958207	7750.4	-448.7	0.070584	-95.8%
	40	0.00629	0.002541957	7808.4	-390.7	0.051276	-95.0%
Sigurd met. data	2nd max over 1 year	**ug/m3**	**/lb/hr**	**elev**	**del ht**	**Scr Tab**	**%diff**
	0.5	0.43787	0.176954951	8298	98.9	4.080658	-95.7%
	1	0.33231	0.134295338	8284.9	85.8	2.369103	-94.3%
	2.5	0.17052	0.068911682	8345.1	146	0.911097	-92.4%
	5	0.07605	0.030733834	8473.1	274	0.390355	-92.1%
	10	0.02087	0.008434124	8064	-135.1	0.258255	-96.7%
	15	0.02364	0.009553555	7951	-248.1	0.157396	-93.9%
	20	0.01941	0.007844099	8015.2	-183.9	0.112865	-93.1%
	25	0.01189	0.004805066	8503.6	304.5	0.048512	-90.1%
	30	0.00884	0.00357248	8070.9	-128.2	0.070584	-94.9%
	40	0.0081	0.003273426	7933.3	-265.8	0.051276	-93.6%

negative % diff shows screening tables predictions are conservatively high as compared to verification analyses

Fishlake NF 12 Well Drilling Scenario

SO2 3 hour Average Verification: Refined Modeling Results vs. Screening Table

Hunter met. data	2nd max over 5 years	refined model predicted impact	**A** pred impact per lb/hr emission	**SO2 3 hour average**	source receptor elev diff	**B** scr table results for src/red ht diff	(A-B)/B
		ug/m3	**/lb/hr**	**elev**	**del ht**	**Scr Tab**	**%diff**
	0.5	9.41507	3.80488101	8325.9	126.8	27.454923	-86.1%
	1	6.10321	2.466470013	8175.7	-23.4	16.490871	-85.0%
	2.5	3.92929	1.587930934	7898.6	-300.5	10.772271	-85.3%
	5	2.26171	0.91401736	7882.4	-316.7	5.377005	-83.0%
	10	1.75134	0.707763225	7792.5	-406.6	2.434743	-70.9%
	15	1.38627	0.560228697	7456.2	-742.9	1.502847	-62.7%
	20	1.17354	0.474258828	8157.5	-41.6	1.082088	-56.2%
	25	1.00662	0.406802002	7750.2	-448.9	0.837414	-51.4%
	30	0.88059	0.355869916	7799.4	-399.7	0.678672	-47.6%
	40	0.70485	0.284848693	7618.3	-580.8	0.073872	285.6%
Sigurd met. data	2nd max over 1 year	**ug/m3**	**/lb/hr**	**elev**	**del ht**	**Scr Tab**	**%diff**
	0.5	8.79908	3.555943014	8305.8	106.7	27.454923	-87.0%
	1	6.93435	2.802355865	8310.4	111.3	14.815665	-81.1%
	2.5	3.81426	1.541444242	8204	4.9	10.772271	-85.7%
	5	2.19613	0.887514732	8273.7	74.6	2.589858	-65.7%
	10	1.14014	0.460760996	8115.4	-83.7	2.434743	-81.1%
	15	1.05792	0.427533701	7951	-248.1	1.502847	-71.6%
	20	0.638	0.257832824	7274.1	-925	0.099513	159.1%
	25	0.71547	0.289140518	8120.9	-78.2	0.837414	-65.5%
	30	0.59722	0.241352538	8112.2	-86.9	0.678672	-64.4%
	40	0.39028	0.157722562	7470.5	-728.6	0.073872	113.5%

negative % diff shows screening tables predictions are conservatively high as compared to verification analyses

Fishlake NF 12 Well Drilling Scenario

SO2 24 hour Average Verification: Refined Modeling Results vs. Screening Table

Hunter met. data	2nd max over 5 years	SO2 24 hour average refined model predicted impact	A pred impact per lb/hr emission		source receptor elev diff	B scr table results for src/red ht diff	(A-B)/B
		ug/m3	**/lb/hr**	**elev**	**del ht**	**Scr Tab**	**%diff**
	0.5	2.16975	0.876853871	8326.8	127.7	12.202188	-92.8%
	1	1.2319	0.497843661	8185.8	-13.3	7.329276	-93.2%
	2.5	0.59774	0.241562684	7813.1	-386	4.787676	-95.0%
	5	0.39002	0.157617489	7867.9	-331.2	2.38978	-93.4%
	10	0.25199	0.101835883	7748.6	-450.5	1.082108	-90.6%
	15	0.18794	0.075951569	8187.8	-11.3	0.667932	-88.6%
	20	0.14669	0.059281343	8157.5	-41.6	0.480928	-87.7%
	25	0.13305	0.053769055	8153.5	-45.6	0.372184	-85.6%
	30	0.11007	0.044482224	7799.4	-399.7	0.301632	-85.3%
	40	0.08811	0.035607602	7618.3	-580.8	0.032832	8.5%
Sigurd met. data	2nd max over 1 year	**ug/m3**	**/lb/hr**	**elev**	**del ht**	**Scr Tab**	**%diff**
	0.5	2.12579	0.859088462	8237.6	38.5	12.454036	-93.1%
	1	1.71395	0.692652928	8310.4	111.3	6.58474	-89.5%
	2.5	0.78418	0.316908062	8091	-108.1	4.787676	-93.4%
	5	0.43967	0.177682379	8199.1	0	2.38978	-92.6%
	10	0.22266	0.089982847	8115.4	-83.7	1.082108	-91.7%
	15	0.20174	0.081528517	7951	-248.1	0.667932	-87.8%
	20	0.12162	0.049149887	8165.4	-33.7	0.480928	-89.8%
	25	0.1504	0.060780653	8120.9	-78.2	0.372184	-83.7%
	30	0.13183	0.053276021	8112.2	-86.9	0.301632	-82.3%
	40	0.08507	0.034379057	8193.4	-5.7	0.219136	-84.3%

negative % diff shows screening tables predictions are conservatively high as compared to verification analyses

Fishlake NF 12 Well Drilling Scenario

SO2 Annual Average Verification: Refined Modeling Results vs. Screening Table

Hunter met. data	2nd max over 5 years	SO2 annual average refined model predicted impact **ug/m3**	**A** pred impact per lb/hr emission **/lb/hr**	**elev**	source receptor elev diff **del ht**	**B** scr table results for src/red ht diff **Scr Tab**	(A-B)/B **%diff**
	0.5	0.52496	0.212150344	8326.8	127.7	3.050547	-93.0%
	1	0.25114	0.101492375	8141.1	-58	1.832319	-94.5%
	2.5	0.07642	0.030883361	8216	16.9	1.196919	-97.4%
	5	0.03784	0.015292154	8074.7	-124.4	0.597445	-97.4%
	10	0.01147	0.004635333	7889.3	-309.8	0.270527	-98.3%
	15	0.01902	0.00768649	8482.3	283.2	0.068602	-88.8%
	20	0.01187	0.004796984	8367.9	168.8	0.047008	-89.8%
	25	0.00936	0.003782626	8408.5	209.4	0.035704	-89.4%
	30	0.00838	0.003386582	7750.4	-448.7	0.075408	-95.5%
	40	0.0077	0.003111775	7808.4	-390.7	0.054784	-94.3%
Sigurd met. data	2nd max over 1 year	**ug/m3**	**/lb/hr**	**elev**	**del ht**	**Scr Tab**	**%diff**
	0.5	0.48265	0.195051744	8316.1	117	3.050547	-93.6%
	1	0.37982	0.153495397	8349	149.9	1.646185	-90.7%
	2.5	0.22143	0.089485771	8294.5	95.4	0.68145	-86.9%
	5	0.09927	0.040117656	8473.1	274	0.287762	-86.1%
	10	0.02298	0.009286831	8064	-135.1	0.270527	-96.6%
	15	0.03047	0.01231374	7951	-248.1	0.166983	-92.6%
	20	0.02068	0.00835734	8015.2	-183.9	0.120232	-93.0%
	25	0.01353	0.005467834	8503.6	304.5	0.035704	-84.7%
	30	0.01086	0.004388816	8070.9	-128.2	0.075408	-94.2%
	40	0.01062	0.004291825	7933.3	-265.8	0.054784	-92.2%

negative % diff shows screening tables predictions are conservatively high as compared to verification analyses

Appendix E

Climate Change

Fishlake N.F. Rationale for Use of Supplemental Information Reports 2 and 2A

Prepared 1/13/2012 by Rob Hamilton

While preparing their oil and gas leasing Environmental Impact Statements, the Dixie and Fishlake National Forests employed JBR Consultants to analyze and model the potential effects of oil and gas leasing on air quality and climate change. As a result, Supplemental Information Reports (SIR) 1, 1A, 1B, 2, and 2A were prepared to analyze the potential effects. This rationale is intended to clarify and compare the differences in potential effects on climate change between the Dixie National Forest (DNF) and Fishlake National Forest (FNF) as presented in SIR-2 and SIR-2A.

The following should be noted:

- The FNF RFDS is based on the assumption that all potentially productive areas are open for leasing under standard terms and conditions, except those areas designated as closed to leasing by law, regulation or executive order. However, it is anticipated that all potentially productive areas would not be open for leasing under standard terms and conditions due to restrictions and stipulations that will likely be needed to conserve sensitive resources. (Supplemental RFDS – 4/22/2011).
- The RFDS for the FNF estimated two plays or fields. Each field would have 2 to 3 pads with up to 5 wells per pad using directional drilling technology for a total estimated 30 wells.
- The distance from Richfield, Utah to Salt Lake City, Utah is approximately 160 miles. The distance from Cedar City, Utah to Salt Lake City, Utah is approximately 250 miles. Therefore, the distance from Cedar City to Salt Lake City is approximately 34% further than from Richfield to Salt Lake City.
- Both Forests are located in the same geographic area, experience similar climatic effects and have similar vegetation types and quantity.

Dixie and Fishlake National Forests RFDS Comparison

	Dixie N.F.	Fishlake N.F.
Number of exploration wells	60	45
Number of plays	1	2
Number of production wells	20	30
Total gross surface disturbance	1,673 ac	1,421
Seismic exploration impact	422 ac	
Total disturbance	2,095 ac	
Total disturbance at end of 15 year analysis period		573.0

Appendix SIR-2

Page	Dixie Reference	Fishlake Reference or Comparison
vi	…summarize the body of scientific knowledge and professional opinion of global warming/climate change, in order to provide a context for evaluation of global warming effects	The report provides context for evaluating global warming effects for the FNF as well as the Dixie.
27	Total emissions estimates for each predicted oil and gas activity (i.e., connected action) are summarized in **Table 3.2-1**.	Comparative emission estimates for the FNF are shown in the table below. Estimates are explained in SIR 2-A discussion below.

Table 3.2-1 (Dixie)

Oil & Gas Activity	CO2e
Exploration	9,993
Production	43,443
Transportation of Crude	2,161
Refining	21,019
Trans. of Refined	868
Product end use	268,312
TOTAL	345,796

Fishlake Estimates (based on 30 wells)

Oil & Gas Activity	CO2e
Exploration	7,495
Production	58,214
Transportation of Crude	2,161
Refining	28,286
Trans. of Refined	868
Product end use	268,312
TOTAL	365,336

Appendix SIR-2 cont.

Page	Dixie Reference	Fishlake Reference or Comparison
28	The estimate of production GHG emissions sought to predict maximum potential GHG emissions and therefore assumed that a full 20-well production field	The RFDS for the FNF estimated two plays or fields. Each field would have 2 to 3 pads with up to 5 wells per pad using directional drilling technology for a total estimated 30 wells.
28	Exploration …	The number of exploratory wells predicted on the FNF is 45 compared to 60 on the DNF.
28	Production …	The number of production wells predicted on the FNF is 30 compared to 20 on the DNF.
28	Transportation of crude … likely destination for the crude oil would be a refinery in the Salt Lake City area.	Predicted effects of transporting oil from random points on the FNF to Salt Lake City would be smaller as FNF is closer to Salt Lake City. However, the FNF RFDS predicted more producing wells thus more crude to be transported. The FNF RFDS also proposed using a refinery in Utah Valley. With these points in mind, we predict that impacts of transporting the crude will be similar to the DNF.
29	Refining …	Any oil and gas produced on the FNF would also have to be refined. It is assumed that since the FNF would have more producing wells more products would be realized with more refining required.
29	Transportation of Refined Product	Impact estimates for the FNF Scenario would be similar to those of the DNF.

Appendix SIR-2 cont.

Page	Dixie Reference	Fishlake Reference or Comparison
29	… Product end use also assumes a demand for refined oil and gas products, which would be independent of any Dixie National Forest oil and gas production. However, product end use must be taken into account in the emission scenario because the demand does exist, due to the need for these fuels and the relatively low price of refined oil and gas products compared to alternative fuels currently available. It can reasonably be assumed, therefore, that if the Dixie National Forest were to discover and produce oil and gas products, they would be used.	It can also be assumed that if the FNF were to discover and produce oil and gas products, they too would be used and this use would also be the largest contributor to the oil and gas predicted activities emissions. The amount of emissions produced by the end use of oil and gas products on the FNF and adjacent areas would be the same or slightly less than on the DNF as the local population base is less.
30	3.2.2 Baseline Conditions of the Dixie are reviewed	Baseline conditions on the FNF are similar to those on the DNF. However, there is currently one active O & G lease of 301.7 acres on the Forest. (See Section 1.12.1, page 23 of the FNF O & G leasing EIS). Demands for O & G. Estimates of carbon sequestration and emissions for the FNF would be similar to that of the DNF and would also follow the national trend
31	Green house gas emissions inventory	The FNF has not conducted a greenhouse gas emissions inventory of its own operations. However, it is likely within the range included in the emissions estimates for the six national forests in the Greater Yellowstone Area also.
32	GHG Emissions from Forest Fires	The FNF has also and will continue to experience forest fires. The resultant green house gasses from future forest fires cannot be predicted though they too would contribute to GHG emissions. However, about 40% fewer acres are impacted by wildfires on the FNF than the DNF.

Dixie and Fishlake National Forest Wildland Fires Comparison
(Average of fires reported and acres burned)

	5 yr # of fires	5 yr # of acres	10 yr # of fires	10 yr # of acres	2011 #of fires	2011 # of acres
Dixie N.F.	57	5464	83	14,564	45	388
Fishlake N.F.	32	10920	50	8,980	36	239
FNF % of DNF			60	62		

Appendix SIR-2 cont.

Page	Dixie Reference	Fishlake Reference or Comparison
38	Table 3.2-15 summarizes the information in Sections 3.2.1 through 3.2.5, showing total CO2 emissions for the Dixie National Forest Oil and Gas Activities …	Predicted CO2 emissions for the FNF would be very comparable to the DNF at 0.365 MMT. Refer to the discussion throughout this document for rationale.
38	4.1.1 Connected Actions GHG Emissions Compared to Existing US and Global emissions	Predicted oil and gas activities on the FNF would increase U.S. and world emissions but at that scale the amount would be negligible. As with the DNF, on a State of Utah scale the increase would be minor.
39	4.1.2 Effects of Connected Actions on Foreseeable Impacts of Climate Change	The effects of oil & gas production on the FNF would be comparable to that of the DNF
39	4.2 Effects of Climate Change on the Dixie NF and the Cumulative Effects Area	Climate change would have similar effects on the FNF and the oil & gas cumulative effects area as it would have on the DNF.

Appendix SIR-2 A

Page	Dixie Reference	Fishlake Reference or Comparison
2	Exploratory Drilling	The number of exploratory wells predicted on the FNF is 45 compared to 60 on the DNF. Therefore, using the same assumptions, about 25% less greenhouse gasses would be produced from exploratory drilling on the FNF
3	Production Operations – Drilling and Pumping	The number of production wells predicted on the FNF is 30 compared to 20 on the DNF. Therefore, using the same assumptions, about 34% more greenhouse gasses would be produced from pumping and drilling on the FNF.
4	Transportation from Field to Refinery	The distance of transporting crude from random points on the DNF to Salt Lake City is further than from random points on the FNF to Salt Lake City. The FNF RFDS assumed a destination refinery in Utah Valley so transportation distance is even less than a refinery in Salt Lake City. However, more production wells are predicted on the FNF so the same impact value will be used for the FNF.
4	Refining into Final Product	Since the number of production wells predicted on the FNF is 30 compared to 20 on the DNF, it can be assumed that 34% more product is produced and 34% more greenhouse gas would be produced from refining that product.
4	Transportation of Final Product to End User	The source of the refined product would not change the amount of greenhouse gasses produced in transporting the final product to the end user. Therefore, the predicted amount of greenhouse gasses would be the same for both the FNF & DNF.

Appendix SIR-2 A continued

Page	Dixie Reference	Fishlake Reference or Comparison
5	End Use	The source of the refined product would not change the amount of greenhouse gasses produced in the end use. Therefore, the predicted amount of greenhouse gasses would be the same for both the FNF and the DNF.

Summary of Greenhouse Gas Emission for FNF Proposed EIS Activities
(compare to DNF SIR-2A Table 3.2.1)

	GHG Emissions	
Process	CO2 (metric tons)	Total GHG Emissions, CO2 (metric tons CO2e)
Exploration	7,495	7,495
Production	58,214	58,214
Transportation of Crude	2,161	2,161
Refining	28,286	28,286
Transportation of Refined Products	868	868
Product End Use	268,312	268,312
Total	365,336	365,336

In summary, the effects of oil and gas leasing and development on the Fishlake would be slightly more than those of the Dixie. Comparatively, they would also be negligible on a national and global scale and minor on a state and regional scale.

Dixie National Forest

Oil & Gas Leasing Environmental Impact Statement
Climate Change Report

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Acronyms and Abbreviations

AMS	American Meteorological Society
BRAC	Blue Ribbon Advisory Council
C	Celsius
CCS	CO_2 Capture and Storage
CCSP	U.S. Climate Change Science Program
CFCs	Chlorofluorocarbons
CH_4	Methane
CO_2	Carbon Dioxide
CO_{2e}	Carbon Dioxide Equivalent
CSP	Concentrating Solar Power
DOE	U.S. Department of Energy
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
F	Fahrenheit
GBRM	Great Basin / Rocky Mountain
GHG	Greenhouse Gas
GISS	Goddard Institute for Space Studies
Gt CO_2-eq	Gigatons of CO_2-equivalent
HCFCs	Hydrochlorofluorocarbons
HFCs	Hydrofluorocarbons
IPCC	Intergovernmental Panel on Climate Change
$MMTCO_2$	Million Metric Tons CO_2
N_2O	Nitrous oxide
NMVOC	Non-methane Volatile Organic Compound
NO_x	Nitrogen Oxides
PFCs	Perfluorocarbons
PPM	Parts Per Million
PM	Particulate Matter
PUCN	Public Utility Commission of Nevada
PV	Photovoltaics
RFDS	Reasonably Foreseeable Development Scenario
SF_6	Sulfur Hexafluoride
SO_X	Sulfur Oxides
UNEP	United Nations Environment Programme
USFS	United States Forest Service
WMO	World Meteorological Organization

Introduction

On January 16, 2009, the Deputy Chief of the Forest Service sent a memo to Regional Foresters and Directors containing guidance for considering climate change in land management and project planning. As part of the *Forest Service Strategic Framework for Responding to Climate Change* (USFS 2008), established by the Chief Gail Kimball in a letter to the National Leadership Team on February 15, 2008, two documents were provided in the memo to guide field units on how to treat climate change: *Climate Change Considerations in Project Level NEPA Analysis* and *Climate Change Considerations in Land Management Planning Revisions*. These documents frame two fundamental challenges: how management may influence climate change through greenhouse gas (GHG) emissions, and how climate change may affect National Forests and Grasslands.

This paper is intended to summarize the body of scientific knowledge and professional opinion of global warming/climate change, in order to provide a context for evaluation of global warming effects under the US Forest Service (USFS) action alternatives of the Dixie National Forest Oil and Gas Leasing Environmental Impact Statement (EIS). It is provided as an overview of climate change, associated science, and projected impacts. Potential global effects to resources as a result of climate change, and potential global impacts of continuing anthropogenic contributions of greenhouses gases to climate change, are also summarized. Regional information on effects to resources is also presented, where available.

Information provided here summarizes current studies by the Intergovernmental Panel on Climate Change (IPCC) and other peer-reviewed publications. The growing level of international attention to climate change has resulted in a high level of ongoing scientific study and analysis. The body of scientific knowledge of the issue is evolving relatively rapidly. The information contained herein may become out-dated quickly, but serves as a “snapshot” of the state-of-knowledge at the time of the analyses conducted under this EIS. The reports referenced herein, and any subsequent reports provided by IPCC or other governmental bodies, should be consulted for more detailed or the most up-to-date information.

1.0 Climate Change Literature Overview

1.1 The Greenhouse Effect (Science / Process)

Joseph Fourier is credited with the discovery in 1824 that gases in the atmosphere might increase the surface temperature of the Earth. Fourier referred to an experiment by M. de Saussure, who exposed a black box to sunlight; he noted that when a thin sheet of glass is put on top of the box, the temperature inside of the box increases. In 1859 John Tyndall identified several gases that could trap heat waves, specifically water vapor and carbon dioxide (CO_2) (Weart 2007).

The energy from the Sun powers the natural systems on earth. Energy is emitted from the Sun in the form of short wavelengths such as light and other electromagnetic rays. However, shortwave energy is not sensible (sensation of heat). Of the shortwave energy that reaches the Earth"s atmosphere from the Sun, approximately one-third is reflected back into space, while the remaining two-thirds reaches the Earth"s surface or is absorbed by the Earth"s atmosphere. Shortwave energy reaching the earth"s surface is either absorbed by the Earth or reflected back into the atmosphere (Le Treut et al. 2007).

To balance the absorbed incoming energy, the Earth must, on average, radiate the same amount of energy back to space. Because the Earth is much colder than the Sun, it radiates at much longer wavelengths, primarily in the infrared part of the spectrum. Much of this thermal radiation emitted by the land and ocean is absorbed by the atmosphere, including clouds, and reradiated back to Earth. This is called the greenhouse effect. The Earth"s greenhouse effect warms the surface of the planet (Le Treut et al. 2007). Without the natural greenhouse effect, the average temperature at Earth"s surface would be approximately 60 degrees F colder. The greenhouse effect creates a climate on Earth that is conducive to life. Therefore, the greenhouse effect is a natural process, upon which life on Earth depends.

Several factors affect the amount of the Sun"s energy that reaches the Earth, and thus affect the climate of Earth. The Sun itself has a cycle and fluctuates in the amount of energy emitted. The tilt of the Earth"s axis controls the amount of the Sun"s energy reaching various parts of the Earth at different times of the year, creating seasons on Earth. The elliptical nature of the Earth"s orbit around the Sun means that at times the Earth is closer to the Sun, resulting in increased energy levels reaching the Earth. Finally, the composition of the Earth"s atmosphere controls how much of the Sun"s energy reaches the surface of the Earth, versus energy that is reflected back into space.

The two primary gases in the atmosphere responsible for the greenhouse effect are water vapor and carbon dioxide. Methane, nitrous oxide, ozone and several other gases present in the atmosphere in small amounts also contribute to the greenhouse effect (Le Treut et al. 2007). Taken together, these are referred to as “greenhouse gases.” In addition to reflecting the Sun"s energy back into space, greenhouse gases also control the amount of heat radiated by the Earth that is trapped beneath the atmosphere. Fluctuations in greenhouse gases in the atmosphere are partially responsible for variances in the Earth"s climate along with other influences. The concentrations of these gases in the atmosphere are affected by complex natural systems that tend to either emit or sequester these gases. Man-made (anthropogenic) influences and emissions also affect the prevalence of these gases in the atmosphere, particularly CO_2 which has been emitted in relatively large and growing quantities since the dawn of the Industrial Revolution when coal and later petroleum were burned for energy.

1.2 Historical Study of and Concern for Earth's Climate Change

A major curiosity for scientists in the late 1800s and early 1900s was solving the mystery of prehistoric ice ages. Svante Arrhenius postulated that by cutting in half the amount of CO_2 in the atmosphere, the temperature in Europe could be lowered some 4-5 degrees C. Arvid Hogbom was the first to attempt to calculate the amounts of CO_2 emitted by factories and other industrial sources, and found that human activities were adding CO_2 to the atmosphere at a rate roughly comparable to the natural geochemical processes that emitted or absorbed the gas. Arrhenius figured it would take thousands of years for burning of fossil fuels to contribute enough CO_2 to the atmosphere to result in raising Earth‟s temperature. Arrhenius‟ theory was dismissed because it was perceived to over simplify the climate system, and because of faulty experimentation and reasoning used to refute the theory (Weart 2007).

In the early 1900s, the prevailing theory regarding the greenhouse effect and global warming was that the Earth automatically regulated itself in a "balance of nature", specifically that the oceans would absorb any excess of CO_2 in the atmosphere, and if the oceans didn‟t absorb the excess, biological systems would (Weart 2007).

Guy Stewart Callendar, also interested in solving the mystery of the ice ages and pursued meteorology as a hobby, decided to scientifically investigate popular opinion that a warming trend was underway. Around 1938 he gathered old data on temperatures and atmospheric concentrations of CO_2, and found a warming trend was underway, and the concentration of CO_2 had increased by 10 percent over the previous 100 years. He postulated that the warming trend could be explained by the increase in CO_2. Through the 1940s and into the 1950s the scientific community regarded the old data used by Callendar as untrustworthy, and the idea of the Earth being in a natural balance persisted (Weart 2007).

In 1952 theoretical physicist Lewis D. Kaplan showed that in the upper atmosphere, adding more CO_2 must change the balance of radiation significantly. Building on this, physicist Gilbert N. Plass performed calculations and theorized that human activity would raise the average global temperature at the rate of 1.1 degree C per century (Weart 2007). Plass‟ calculations were dismissed by the scientific community because, once again, they over simplified the climate system, not taking into account the influence of various components of the system (Weart 2007).

During the 1950s, discovery of the radioactive isotope carbon-14 enabled scientists to distinguish fossil carbon in the atmosphere. Measurements of carbon in the atmosphere in conjunction with calculations estimating the carbon being taken up by the oceans led to the realization that although sea water did rapidly absorb CO_2, most of the added gas would promptly evaporate back into the air. By the late 1950s, a few scientists began to warn that greenhouse warming might become a problem, even within the foreseeable future (Weart 2007).

In the late 1950s and early 1960s, a baseline level of CO_2 measured in the atmosphere of Antarctica and the Mauna Loa volcano in Hawaii established that the level of CO_2 in the atmosphere was rising. The baseline data supported the theory that the oceans were not taking up most industrial emissions. Through the 1960s, interdisciplinary sharing of information resulted in the first reasonably solid estimate of the global temperature change that was likely if the amount of CO_2 in the atmosphere doubled. However, the scientific community continued to persist with the assumption that "…the Earth‟s geochemistry was dominated by stable mineral processes, operating on a planetary scale over millions of years." (Weart 2007) The debate continued into the 1970s; the veracity of old data was questioned, and historical temperature shifts could not be tied to CO_2 levels in the atmosphere, casting doubt on theories connecting human activity with CO_2 levels in the atmosphere and possible climactic effects. By the end of the 1970s, however, measurements of CO_2 levels in the atmosphere showed a clear rise, global temperatures began to rise again, and computer models were resulting in agreement on the future warming to be expected from increased CO_2 (Weart 2007).

The 1980s brought a remarkable discovery. Chemical analysis of air trapped in ice cores drilled from the Greenland and Antarctic ice caps produced a record of temperature variations and provided air samples spanning hundreds of thousands of years. Testing of ice samples from the time of the last ice age showed CO_2 levels in the atmosphere were as much as 50 percent lower than in current warmer times. Researchers working with these and other data found that the level of atmospheric CO_2 had gone up and down in remarkably close step with temperature. The modern air above the ice had reached levels of CO_2 concentrations far above anything seen in the geological era represented in the ice cores. Data from studies of paleontology and water temperatures in ocean basins mirrored trends linking temperature fluctuations with CO_2 concentrations, ultimately affirming computer modeling techniques (Weart 2007).

1.3 Global Community Action

1.3.1 Establishment of the Intergovernmental Panel on Climate Change

Concerns about human impacts on world climate led to efforts to organize and mobilize the scientific community world-wide. The first World Climate Conference organized by the World Meteorological Organization in 1979 called for, "global cooperation to explore the possible future course of global climate and to take this new understanding into account in planning for the future development of human society" (IPCC 2004).

The Advisory Group on Greenhouse Gases was established by the United Nations Environment Programme (UNEP), World Meteorological Organization (WMO), and International Council for Science as a result of a joint 1985 conference to assess the role of carbon dioxide and of other greenhouse gases in climate variations and associated impacts. The Advisory Group on Greenhouse Gases was established, "… to ensure periodic assessments of the state of scientific knowledge on climate change and its implications" (IPCC 2004).

The Intergovernmental Panel on Climate Change (IPCC) by the UNEP was established in concert with the WMO in 1988. The role of the panel is to, "assess on a comprehensive, objective, open and transparent basis the best available scientific technical and socio-economic information on climate change from around the world. The assessments are based on information contained in peer-reviewed literature and, where appropriate documented, in industry literature and traditional practices" (IPCC 2007a).

The United Nations General Assembly endorsed the action of the WMO and UNEP to establish the IPCC in 1988. Assessments produced by the IPCC are discussed in the following section.

The IPCC (2004) provides the following definition for climate change:

> Climate change refers to a statistically significant variation in either the mean state of the climate or in its variability, persisting for an extended period (typically decades or longer). Climate change may be due to natural internal processes or external forcings, or to persistent anthropogenic changes in the composition of the atmosphere or in land use.

1.3.2 First Assessment Report

"In conjunction with endorsing the IPCC, in 1988 the General Assembly requested as soon as possible a comprehensive review and recommendations with respect to:

- The state of knowledge of the science of climate and climatic change.

- Programs and studies on the social and economic impact of climate change, including global warming.
- Possible response strategies to delay, limit, or mitigate the impact of adverse climate change.
- The identification and possible strengthening of relevant existing international legal instruments having a bearing on climate.
- Elements for inclusion in a possible future international convention on climate." (IPCC 2004).

In 1989, the 44th session of the General Assembly requested the report by the IPCC to be submitted to its 45th Session. Responding to this request, the IPCC adopted its First Assessment Report on August 30, 1990 (IPCC 2004). The report consisted of three components:

- Working Group I: Addressed a broad range of topics including greenhouse gases and aerosols, radiative forcing (defined by UNEP (2008) as the change in the balance between radiation coming into the atmosphere and radiation going out.), processes and modeling, observed climate variations and change, and detection of greenhouse effect in the observations. Key findings included:
    - Experts were certain that emissions from human activities were substantially increasing the atmospheric concentrations of greenhouse gases and that this will enhance the greenhouse effect resulting in additional warming of the Earth‟s surface.
    - Under business as usual, a predicted rate of increase of the global mean temperature during the 21st century of 0.3 degrees C per decade with an uncertainty range of 0.2 degrees C to 0.5 degrees C;
    - Under business as usual, a predicted increase of the global mean sea level of 6 cm per decade with an uncertainty range of 3 to 10 cm per decade
    - A number of uncertainties were identified, including sources and sinks of greenhouse gases and the role of clouds, oceans and polar ice sheets.
- Working Group II: Summarized the scientific understanding of climate change impacts on impacts to agriculture and forestry, natural terrestrial ecosystems, hydrology and water resources, human settlements, oceans and coastal zones and seasonal snow cover, ice and permafrost.
    - Predicted impacts would be felt most severely in regions already under stress, mainly developing countries
    - Highlighted important uncertainties with regard to timing, magnitude and regional patterns of climate change.
- Working Group III: Defined mitigative and adaptive response options in the areas of energy and industry; agriculture, forestry and other human activities; coastal zone management, emissions scenarios and the implementation of mitigation measures.
    - Presented a flexible and progressive approach comprising of shorter-term mitigation and adaptation measures and proposals for more intensive action over the longer-term.
    - Developed possible elements for inclusion in a framework convention on climate change.

- Presented proposals to promote as rapidly as possible full participation of developing countries (IPCC 2004).

1.3.3 Supplementary Reports

The General Assembly established the Intergovernmental Negotiating Committee in 1990 in order to initiate negotiations of an effective framework convention on climate change. In 1992 the IPCC prepared supplementary reports to meet the need for up-to-date information of the negotiating process. Six tasks addressed by the Supplementary Reports included:

- Assessment of national net greenhouse gas emissions (which eventually became the national greenhouse gas inventories program)
- Predictions of regional distributions of climate change and associated impact studies,
- Energy and industry related issues,
- Agriculture and forestry related issues,
- Vulnerability to sea level rise, and
- Emissions scenarios (IPCC 2004)

1.3.4 United Nations Framework Convention on Climate Change and Conference of the Parties

The United Nations Framework Convention on Climate Change was adopted and opened for signature in June 1992, and entered into force in 1994 (IPCC 2004). “The Convention on Climate Change sets an overall framework for intergovernmental efforts to tackle the challenge posed by climate change. It recognizes that the climate system is a shared resource whose stability can be affected by industrial and other emissions of carbon dioxide and other greenhouse gases. The convention enjoys near universal membership, with 192 countries having ratified. Under the Convention, governments:

- Gather and share information on greenhouse gas emissions, national policies and best practices
- Launch national strategies for addressing greenhouse gas emissions and adapting to expected impacts, including the provision of financial and technological support to developing countries
- Cooperate in preparing for adaptation to the impacts of climate change.” (UNFCCC 2008)

The Convention defines climate change as, “a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.” (IPCC 2004)

1.3.5 Second Assessment Report

The Second IPCC Assessment Report was issued in 1995. The report differed from the First Assessment Report in that it included as a new subject area socioeconomic aspects of climate change. New findings from the Second Assessment include:

<u>Working Group I</u>

- Greenhouse gas concentrations have continued to increase;
- Anthropogenic aerosols tend to produce negative radiative forcing;
- Climate has changed over the past century;

- The balance of evidence suggests a discernible human influence on global climate;
- Climate is expected to continue to change in the future; and
- There are still many uncertainties

Working Group II

- Human induced climate change adds an important new stress;
- Most systems are sensitive to climate change
- Impacts are difficult to quantify, and existing studies are limited in scope;
- Successful adaptation depends on technological advances, institutional arrangements, availability of financing and information exchange;
- Vulnerability increases as adaptive capacity decreases
- Detection will be difficult, and unexpected changes cannot be ruled out
- Further research and monitoring are essential.

Working Group III

- A prudent way to deal with climate change is through a portfolio of actions aimed at mitigation, adaptation, and improvement of knowledge
- Earlier mitigation action may increase flexibility in moving toward stabilization of atmospheric concentrations of greenhouse gases;
- Significant “no-regrets” opportunities are available in most countries and that the risk of aggregate net damage due to climate change, consideration of risk aversion and application of the precautionary principle provide rationales for action beyond no regrets.
- The value of better information about climate processes, their impacts and responses and the need for more research and analysis of economic and social issues related to climate change are highlighted. (IPCC 2004)

Another change between the First and Second reports was the development of the Synthesis Report. The Synthesis Report provided scientific, technical and socioeconomic information that can be used in evaluating whether the projected range of plausible impacts constitutes “dangerous anthropogenic interference with the climate system,” and in evaluating adaptation and mitigation options that could be used in progressing towards the ultimate objective of the Convention on Climate Change (IPCC 2004).

1.3.6 Second Conference of the Parties

In 1996 the Second Conference of the Parties recognized and endorsed the Second Assessment Report, and believed the report would provide a scientific basis, and called on parties for the development of a protocol or other legal instrument. The Second Conference noted the following findings:

- The balance of evidence suggests a discernible human influence on global climate. Without mitigation, the global average surface temperature relative to 1990 is projected to increase by about 2 degrees C (between 1 and 3.5 degrees C) by 2100; average sea level is projected to rise by about 50 centimeters (between 15 and 95 centimeters) above present levels by 2100. Stabilization of atmospheric concentrations at twice pre-industrial levels will eventually require global emissions to be less than 50 percent of 1996 levels;

- The projected changes in climate will result in significant, often adverse, impacts on many ecological systems and socioeconomic sectors, including food supply and water resources, and on human health. In some cases, the impacts are potentially irreversible; developing countries and small island countries are typically more vulnerable to climate change;

- Significant reductions in net greenhouse gas emissions are technically possible and economically feasible by utilizing an array of technology policy measures that accelerate technology development, diffusion and transfer; and significant no-regrets opportunities are available in most countries to reduce net greenhouse gas emissions. (IPCC 2004)

1.3.7 Kyoto Protocol

As greenhouse gas emissions continued to rise around the world, the Parties determined that a firm and binding commitment would be needed to reduce emissions. The 1997 Kyoto Protocol shares the objective and institutions of the Convention; however the Protocol commits the parties to stabilize greenhouse gas emissions. The Protocol requires developed countries to reduce their emissions below levels specified for each of them in the Treaty, resulting in a total cut in greenhouse gas emissions of at least 5 percent against the baseline of 1990. The Kyoto Protocol was ratified by 141 nations in February 2005 (IPCC 2004). However, the Treaty places a heavier burden on developed nations, which is why Australia and the United States refused to join. "Bush administration officials said the treaty would hurt the economy and is ineffective and discriminatory because large, rapidly industrializing countries such as China and India escape the limits." (Washington Post 2005)

In 2000 the IPCC released the Special Report on Emissions Scenarios. The new scenarios offered alternative images of how the future might unfold in order to analyze how driving forces may influence future emissions outcomes and assess the associated uncertainties (IPCC 2000).

1.3.8 Third Assessment Report

The Third IPCC Assessment Report was issued in 2001. Key findings included:

<u>Working Group I</u>

- An increasing body of observations gives a collective picture of a warming world and other changes in the climate system.
- Emissions of greenhouse gases and aerosols due to human activities continue to alter the atmosphere in ways that are expected to affect the climate.
- Confidence in the ability of models to project future climate has increased.
- There is new and stronger evidence that most of the warming over the last 50 years is attributable to human activities.
- Human influences will continue to change atmospheric composition throughout the 21st century.
- Global average temperature and sea level are expected to rise under all IPCC Special Report on Emission Scenarios.
- Atmospheric climate change will persist for many centuries.

<u>Working Group II</u>

- Recent regional climate changes, particularly temperature increases, have already affected many physical and biological systems.

- There are preliminary indications that some human systems have been affected by recent increases in floods and droughts.
- Natural systems are vulnerable to climate change, and some will be irreversibly damaged.
- Many human systems are sensitive to climate change and some are vulnerable.
- Projected changes in climate extremes could have major consequences.
- The potential for large scale and possibly irreversible impacts poses risks that have yet to be reliably quantified.
- Adaptation is a necessary strategy at all scales to compliment climate change mitigation efforts.
- Those with the least resources have the least capacity to adapt and are the most vulnerable.
- Adaptation, sustainable development, and enhancement of equity can be mutually reinforcing.

<u>Working Group III</u>

- Alternative development paths can result in very different greenhouse gas emissions.
- Climate change mitigation will both be affected by, and have impacts on, broader socioeconomic policies and trends, such as those relating to development, sustainability and equity.
- Significant progress relevant to greenhouse gas emissions reduction has been made since the Second Assessment Report in 1995 and has been faster than anticipated.
- Forests, agricultural lands, and other terrestrial ecosystems offer significant carbon mitigation potential. Although not necessarily permanent, conservation and sequestration of carbon may allow time for other options to be further developed and implemented.
- Most model results indicate that known technological options could achieve a broad range of atmospheric CO_2 stabilization levels, such as 550ppmv, 450ppmv or below over the next 100 years or more, but implementation would require associated socioeconomic and institutional changes.
- Some sources of greenhouse gas emissions can be limited at no or negative social costs to the extent that policies can exploit no regrets opportunities.
- Emission constraints in Annex I countries have well established, albeit varied “spillover” effects on non-Annex I countries.
- The effectiveness of climate change mitigation can be enhanced when climate policies are integrated with the non-climate objectives of the national and sectoral policy development.

<u>Synthesis Report</u>

The Synthesis Report provided a synthesis and integration of information contained in the Third Assessment Report and previous IPCC Reports. Nine relevant scientific technical and socioeconomic questions were addressed:

- Scientific technical information relevant for the ultimate objective of the UNFCCC (IPCC 2004). The Synthesis Report identified what would become referenced as the five reasons for concern:
    - Risks to unique and threatened systems.
    - Risks associated with extreme weather events.
    - The distribution of impacts.
    - Aggregate impacts.
    - Risks of large-scale, high-impact events (IPCC 2001a).
- Attribution of observed changes in climate and ecological systems since the pre-industrial era.
- The impact of future emissions of greenhouse gases on climate, including changes in variability and extreme events and in ecological and the socioeconomic systems.
- Inertia in the climate, ecological systems and socioeconomic sectors, and the implications for mitigation and adaptation.
- Near and long term implications of stabilizing atmospheric concentrations of greenhouse gases.
- Technologies, policies, and costs of near and long term mitigation.
- Interaction between climate change and other environmental issues and development.
- Robust findings and key uncertainties (IPCC 2004).

1.3.9 Fourth Assessment Report

The Fourth IPCC Assessment Report was developed with an aim to emphasize new findings (IPCC 2004), and was issued in 2007. Key findings included:

<u>Working Group I</u>

- Global atmospheric concentrations of carbon dioxide, methane and nitrous oxide have increased markedly as a result of human activities since 1750 and now far exceed pre-industrial values determined from ice cores spanning many thousands of years. The global increases in carbon dioxide concentration are due primarily to fossil fuel use and land use change, while those of methane and nitrous oxide are primarily due to agriculture.
- The understanding of anthropogenic warming and cooling influences on climate has improved since the Third Assessment Report, leading to very high confidence that the globally averaged net effect of human activities since 1750 has been one of warming, with radiative forcing.
- Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, rising global average sea level, changes in Arctic temperatures and ice, widespread changes in precipitation amounts, ocean salinity, wind patterns and aspects of extreme weather including droughts, heavy precipitation, heat waves and intensity of tropical cyclones.
- Paleoclimate information supports the interpretation that the warmth of the last half century is unusual compared to at least the previous 1,300 years. The last time the Polar

Regions were significantly warmer than present for an extended period (about 125,000 years ago), predictions in polar ice volume led to 4 to 6 meters of sea level rise.

- Most of the observed increase in globally averaged temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations.

- Analysis of climate models together with constraints from observations enables an assessed range to be given for climate sensitivity for the first time and provides increased confidence in the climate system response to radiative forcing.

- For the next two decades a warming of about 0.2 degrees C per decade is projected for a range of Special Report on Emission Scenarios. Even if the concentrations of all greenhouse gases and aerosols has been kept constant at year 2000 levels, a further warming of about 0.1 degrees C per decade would be expected.

- Continued greenhouse gas emissions at or above current rates would cause further warming and induce many changes in the global climate system during the 21st century that would very likely be larger than those observed during the 20th century.

- Anthropogenic warming and sea level rise would continue for centuries due to the timescales associated with climate processes and feedbacks, even if greenhouse gas concentrations were to be stabilized (IPCC 2007b).

<u>Working Group II</u>

- With regard to changes in snow, ice and frozen ground (including permafrost), there is high confidence that natural systems are affected.

- Based on growing evidence, there is high confidence that increased and earlier spring runoff is occurring in many glacier and snow-fed rivers, and lakes are warming in many regions.

- There is very high confidence, based on more evidence from a wider range of species, that recent warming is strongly affecting terrestrial biological systems, including earlier timing of spring events and poleward and upward elevation shifts in ranges in plant and animal species.

- Based on satellite observations since the early 1980s, there is high confidence that there has been a trend in many regions toward earlier „greening" of vegetation in the spring linked to longer thermal growing seasons due to recent warming.

- There is high confidence, based on substantial new evidence, that observed changes in marine and freshwater biological systems are associated with rising water temperatures, as well as related changes in ice cover, salinity, oxygen levels and circulation.

- The uptake of anthropogenic carbon since 1700 has led to the oceans becoming more acidic, with an average decrease in pH of 0.1 units. However the effects of observed ocean acidification on the marine biosphere are as yet undocumented (IPCC 2007c).

<u>Working Group III</u>

- Global greenhouse gas emissions have grown since pre-industrial times, with an increase of 70 percent between 1970and 2004.

- With current climate change mitigation policies and related sustainable development practices, global greenhouse gas emissions will continue to grow over the next few decades. In order to stabilize the concentration of greenhouse gases in the atmosphere, emissions would need to peak and decline thereafter. Mitigation efforts over the next two to three decades will have a large impact on opportunities to achieve lower stabilization levels.

- Both bottom-up and top-down studies indicate that there is substantial economic potential for the mitigation of global greenhouse gas emissions over the coming decades, that could offset the projected growth of global emissions or reduce emissions below current levels.

- In 2030 macroeconomic costs for multi-gas mitigation, consistent with emissions trajectories towards stabilization between 445 and 710 parts per million (ppm) CO_2-eq,, are estimated at between a 3 percent decrease of global GDP and a small increase, compared to the baseline. However, regional costs may differ significantly from global averages.

- While studies use different methodologies, in all analyzed world regions near-term health co-benefits from reduced air pollution as a result of actions to reduce greenhouse gas emissions can be substantial and may offset a substantial fraction of mitigation costs.

- New energy infrastructure investments in developing countries, upgrades of energy infrastructure in industrialized countries, and policies that promote energy security, can, in many cases, create opportunities to achieve greenhouse gas emission reductions compared to baseline scenarios.

- Agricultural practices collectively can make a significant contribution at low cost to increasing soil carbon sinks, to greenhouse gas emission reductions, and by contributing biomass feedstocks for energy use.

- Forest-related mitigation activities can considerably reduce emissions from sources and increase CO_2 removals by sinks at low costs, and can be designed to create synergies with adaptation and sustainable development

- Geo-engineering options, such as ocean fertilization to remove CO_2 directly from the atmosphere, or blocking sunlight by bringing material into the upper atmosphere, remain largely speculative and unproven, and with the risk of unknown side-effects.

- Policies that provide a real or implicit price of carbon could create incentives for producers and consumers to significantly invest in low-greenhouse gas products, technologies and processes.

- There are still relevant gaps in currently available knowledge regarding some aspects of mitigation of climate change, especially in developing countries. Additional research addressing those gaps would further reduce uncertainties and thus facilitate decision-making related to mitigation of climate change (IPCC 2007d).

<u>Synthesis Report</u>

- Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level.

- There is medium confidence that other effects of regional climate change on natural and human environments are emerging, although many are difficult to discern due to adaptation and non-climatic drivers.

- Anthropogenic warming over the last three decades has likely had a discernible influence at the global scale on observed changes in many physical and biological systems.

- There is high agreement and much evidence that with current climate change mitigation policies and related sustainable development practices, global greenhouse gas emissions will continue to grow over the next few decades.
- Anthropogenic warming could lead to some impacts that are abrupt or irreversible, depending upon the rate and magnitude of climate change.
- A wide array of adaptation options is available, but more extensive adaptation than is currently occurring is required to reduce vulnerability to climate change. There is high confidence that neither adaptation nor mitigation alone can avoid all climate change impacts; however, they can complement each other and together can significantly reduce the risks of climate change.
- Many impacts can be reduced, delayed or avoided by mitigation. Mitigation efforts and investments over the next two to three decades will have a large impact on opportunities to achieve lower stabilization levels. Delayed emission reductions significantly constrain the opportunities to achieve lower stabilization levels and increase the risk of more severe climate change impacts (IPCC 2007e).

1.3.10 Fifteenth Conference of the Parties

The publication of the IPCC Fourth Assessment Report in 2007, containing the most definitive science to date about climate change and its consequences, as well as the 2012 expiration of the Kyoto Protocol, spurred the global community to take definitive steps toward negotiating a new global climate agreement by the end of 2009.The Fifteenth Conference of the Parties is where the Convention hoped to establish a new global climate treaty to replace the Kyoto Protocol. Copenhagen did see a political accord that provides for explicit emission pledges by all the major economies for the first time, including China. However, a treaty with binding commitments was not reached. Key elements of the Copenhagen accord (as described by the Pew Center for Global Climate (PCGCC 2010) include:

- Setting the goal of limiting global temperature increase to 2 degrees Celsius,
- A process for countries to enter their specific mitigation pledges by 13 January 2010,
- Broad terms for the reporting and verification of countries" actions,
- A collective commitment by developing countries for $30 billion in “new and additional” resources in 2010-2012 to help developing countries reduce emissions, preserve forests, and adapt to climate change,
- A goal of mobilizing $100 billion a year by 2020 to address developing country needs,
- Establishment of a Copenhagen Green Climate Fund, a High Level Panel to examine ways of meeting the 2020 finance goal, a new Technology Mechanism, and a mechanism to channel incentives for reduced deforestation.

1.3.11 Fifth Assessment Report

The decision to prepare a Fifth Assessment Report was made by the IPCC at its 28th Session in April 2008. The preparation of the Fifth Assessment Report pursues the overall mandate of the IPCC, which is to prepare comprehensive assessment reports about climate change at regular (5 to 7-year) intervals. Working Group (I-III) structures will remain the same for the Fifth Assessment Report as in past Reports. The Working Group I Report (physical science basis) is to be finalized in 2013, and the Working Group II (impacts, adaptation and vulnerabilities) and Working Group III (mitigation) reports are to be finalized in early 2014.

The most recent IPCC meeting (31st Session; 26-29 October 2009 in Bali, Indonesia) focused on defining the scope of the Fifth Assessment Report, and specifically the decision was made that Article Two of the United Nations Framework Convention on Climate Change would be a major theme (see IPCC 1995).

1.4 Anthropogenic Contributions and Relationship to Climate Change

Human-induced increases in greenhouse gases in the atmosphere increase the radiant heat from Earth that is trapped in the atmosphere, resulting in increased temperatures on Earth. In this way, anthropogenic effects on climate have resulted from humans increasing the levels of carbon dioxide and other greenhouse gases in the atmosphere, resulting in increased temperatures on Earth.

Overall, the electric power industry was the single largest contributor to greenhouse gas emissions in 2007, responsible for approximately 34 percent of all greenhouse gas emissions from the U.S. in 2005 (EPA 2009a). The second and third highest contributors were transportation and industry, emitting 28 percent and 19 percent respectively.

Concentrations of CO_2 in the atmosphere has been the main focus of scientific investigation with regard to anthropogenic effects on Earth‟s climate, largely because CO_2 is the second highest concentration of greenhouse gas in the atmosphere behind water vapor. However, other atmospheric components lend themselves to anthropogenic forcing including methane, nitrous oxide, and halocarbons. In addition, aerosols are now believed to also play a key role.

On December 7, 2009, the EPA signed two distinct findings regarding greenhouse gases under Section 202(a) of the Clean Air Act as defined by the Supreme Court in 2007 (*Massachusetts v. EPA*, 549 U.S. 497). The first, an "endangerment" finding, determines that greenhouse gases are a threat to human health and welfare. The second, a "cause or contribute" finding, determines that the combined emissions of greenhouse gases from motor vehicles contribute to the greenhouse gas pollution that threatens public health and welfare. At this stage, EPA‟s findings do not impose any requirements on industry or other entities.

1.4.1 Carbon Dioxide

Testing of the air in bubbles trapped in ice cores has revealed that atmospheric carbon dioxide levels are 36 percent higher than before the Industrial Revolution (EPA 2009a). The atmospheric concentration of carbon dioxide in 2005 exceeded the natural range over the last 650,000 years (Le Treut et al. 2007). From 1990 to 2007 the U.S. CO_2 emissions increased by 20.2 percent (EPA 2009a).

Approximately 85 percent of the 2007 greenhouse gas emissions from the United States were CO_2 (EPA 2009a). The main anthropogenic source of CO_2 in the atmosphere is the consumption of energy from fossil fuels (IPCC 2001b). Other factors include burning of solid waste, trees and wood products, and also as a result of other chemical reactions including production of cement. CO_2 from fossil fuel combustion accounted for 80 percent of CO_2 emissions in 2005. Electricity generators consumed 36 percent of the U.S. energy from fossil fuels and emitted 42 percent of the CO_2 from fossil fuel combustion in 2007. Of the fossil fuel CO_2 emissions in the United States in 2005, approximately 42 percent was from petroleum, 34 percent was from coal, and 20 percent was from natural gas (EPA 2009a).

A carbon sink is defined as a place where carbon accumulates and is stored, such as in plants as they accumulate carbon dioxide during the process of photosynthesis and store it in their tissues as carbohydrates and other organic compounds (Australian Greenhouse Office 2007). Changes to or reductions in plant cover result in a reduction in the ability of biological processes to remove CO_2 from the atmosphere. This contributes to increasing CO_2 levels in the atmosphere. Thus changes in land use are the other major contributor to CO_2 concentrations in the atmosphere, primarily through deforestation, the effects of fire and grazing on savannahs and grasslands; reductions in peats and wetlands; and conversion of natural vegetation to agriculture (IPCC 2001b).

1.4.2 Methane

The global atmospheric concentration of methane is over 148 percent higher than pre-industrial levels (EPA 2009a). The atmospheric concentration of methane in 2005 exceeded the natural range over the last 650,000 years (Le Treut et al. 2007). Proportionally, methane makes up a much smaller part of greenhouse gases in the atmosphere than CO_2. However, methane is more than 20 times as effective as CO_2 at trapping heat in the atmosphere (IPCC 2001b; Hofmann 2004 in EPA 2009a).

The primary anthropogenic source of methane in the United States in 2007 was enteric fermentation (i.e., cattle ruminants). Other anthropogenic sources of methane in the atmosphere include landfills, natural gas systems, manure management, petroleum systems, waste treatment, and coal mining (EPA 2009a). In 2007, methane represented 8.2 percent of all U.S. emissions (EPA 2009a).

1.4.3 Nitrous Oxide

Atmospheric concentrations of nitrous oxide are 18 percent higher than pre-industrial levels (EPA 2009a). While total nitrous oxide emissions are lower than CO_2 emissions, nitrous oxide is approximately 300 times more powerful than CO_2 at trapping heat in the atmosphere.

The primary anthropogenic source of nitrous oxide in the atmosphere is agricultural soil management. Nitrous oxide is a primary ingredient in many common fertilizers used in agricultural operations. Other anthropogenic sources include mobile combustion, nitric acid production, manure management, and stationary combustion (EPA 2009a). In 2007, nitrous oxide represented 4.4 percent of all U.S. emissions (EPA 2009a).

1.4.4 Halocarbons

Halocarbons are any of various compounds of carbon and one or more halogens (such as chlorine or fluorine). Chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs) and halons (halocarbons containing bromine) are ozone depleting substances covered under the Montreal Protocol on Substances that Deplete the Ozone Layer. Since implementation of the Montreal Protocol, production of ozone depleting substances is being phased out, and these substances are being replaced by hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6), as they do not deplete stratospheric ozone. They are, however, powerful greenhouse gases with high global warming potentials and extremely long atmospheric lifetimes. Emissions resulting from the substitution of ozone depleting substances have been increasing, and are both the largest and fastest growing source of HFC, PFC, and SF_6 emissions (EPA 2009a).

1.4.5 Indirect Greenhouse Gases and Aerosols

There are also several gases that do not have a direct global warming effect but indirectly affect terrestrial and/or solar radiation absorption by influencing the formation or destruction of greenhouse gases, including tropospheric and stratospheric ozone. These gases include carbon monoxide (CO), oxides of nitrogen (NOx), non-CH_4 volatile organic compounds (NMVOCs), and sulfur dioxide (SO_2). Aerosols, which are extremely small particles or liquid droplets, such as those produced by sulfur dioxide (SO_2) or elemental carbon emissions, absorb and emit heat, reflect light and, depending on their properties, can either cool or warm the atmosphere (EPA

2009a). However, an important characteristic of aerosols is that they have short atmospheric lifetimes and for this reason any cooling effect cannot be considered as a long-term offset to the warming influence of greenhouse gases (IPCC 2001b). Indirect greenhouse gases may also react with other chemical compounds in the atmosphere to form compounds that are greenhouse gases (EPA 2009a).

The primary source of aerosols in the atmosphere is dust. Dust may be naturally entrained in the atmosphere from volcanic eruptions or wind erosion of the earth‟s surface. A significant proportion of this dust may be anthropogenic in that it results from human ground disturbance. Other sources of aerosols include biomass burning and fossil fuels (IPCC 2001b).

Oil and gas activities emit all four indirect greenhouse gases that contribute to the formation of aerosols. In 2007, oil and gas activities emitted 2 percent of all U.S. NOx emissions, 0.5 percent of all U.S. CO emissions, 4 percent of all U.S. NMVOC emissions, and 2 percent of all US SO_2 emissions (EPA 2009a).

1.5 Effects of Anthropogenic Contributions to Climate

1.5.1 Temperature

"Global temperature is a popular metric for summarizing the state of global climate." (Hansen et al. 2006). Measurement of temperatures of nearly all regions of the world was in place by the early 20th century. Temperature measurements for the Polar Regions began in the 1940s and 1950s (NCDC 2008).

The global average surface temperature of the Earth increased about 0.7 degrees C (1.26 degrees F) between the late 1800s and 2000. Most of this warming occurred in the past three decades, during which time the Earth had been warming at a rate of about 0.2 degrees C/decade (0.36 degrees F/decade) (Hansen n.d.).

The highest global surface temperature in more than a century of instrumental data was recorded in the 2005 calendar year in the Goddard Institute for Space Studies (GISS) annual analysis (GISS 2005). Calendar year 2008 was the coolest year since 2000, and the ninth warmest year since 1880, the period of instrumental measurements (GISS 2009). Including 2005 data, total global warming has been 0.6 degrees C in the past three decades and 0.8 degrees C in the past century. After 1975, there has been rapid warming of almost 0.2 degrees C per decade (GISS 2009).

1.5.2 Climate

More intense and longer droughts have been observed over wider areas since the 1970s, particularly in the tropics and subtropics. Increased drying linked with higher temperature and decreased precipitation has contributed to changes in drought. Changes in sea surface temperatures, wind patterns, and decreased snowpack and snow cover have also been linked to droughts (IPCC 2007a).

1.5.3 El Niño/La Niña

The El Niño phenomenon occurs in the equatorial Pacific Ocean and is characterized by an increase in ocean surface temperature of 0.5 degrees Celsius (0.9 degrees F) or greater than the normal temperature, averaged over a three month period (NOAA 2005). The warmer ocean surface temperatures tend to generate storm clouds, resulting in unusual weather patterns and increased precipitation. These temperature fluctuations also influence mid-latitude westerly winds that flow from the Pacific across the United States. These winds tend to favor the Pacific Southwest during El Niño years.

Conversely, La Niña is characterized by a decrease of at least 0.5 degree Celsius (0.9 degrees F), resulting in a lower than normal sea surface temperature, averaged over a three month period (NOAA 2005). The mid-latitude westerly winds favor the Pacific Northwest during La Niña. The cool water impedes the formation of clouds and tropical thunderstorms, therefore leading to dry conditions.

These phenomena are not caused by global warming. However it has been hypothesized that warmer global sea surface temperatures can enhance the El Niño phenomenon, and El Niños have been more frequent and intense in recent decades.

General affects of El Niño in the American Southwest (WRCC 1998) include:

- The period from October through March tends to be wetter than usual
- Winter temperatures tend to be cooler than normal
- Higher elevation snowpack tends to be deeper
- Spring and summer stream flow is greater
- Likelihood of flooding is increased

La Niña affects on climate in the Southwest are nearly the opposite of El Niño (WRCC 1998).

1.5.4 Tropical Storms

There is observational evidence for an increase of intense tropical cyclone activity in the North Atlantic since about 1970, correlated with increases of tropical sea surface temperatures. There are also suggestions of increased tropical cyclone activity in some other regions where concerns over data quality are greater. Multi-decadal variability and the quality of the tropical cyclone records prior to routine satellite observations in about 1970 complicate the detection of long-term trends in tropical cyclone activity. There is no clear trend in the annual numbers of tropical cyclones (IPCC 2007a).

In the North Atlantic, for which there are the best records, there has been a clear increase in the number and intensity of tropical storms and major hurricanes. From 1850-1990, the overall average number of tropical storms was about 10, including about 5 hurricanes. Since 1995, the 10-year average has risen dramatically, with the 1997-2006 average at about 14 tropical storms, including about 8 hurricanes. This increase in frequency correlates strongly with the rise in North Atlantic sea surface temperature, and recent peer-reviewed scientific studies link this temperature increase to global warming (PCGCC 2008).

There is an ongoing scientific debate about the link between increased North Atlantic hurricane activity and global warming. The 2007 report of the Intergovernmental Panel on Climate Change rates the probability of such a link as “more likely than not” (PCGCC 2008).

2.0 Potential Environmental Impacts of Climate Change on Resources

The Strategic Plan for the U.S. Climate Change Science Program (www.climatescience.gov or http://www.globalchange.gov; US CCSP 2003) defines uncertainty as:

An expression of the degree to which a value (e.g., the future state of the climate system) is unknown.

Uncertainties can generally be classified into two primary types: value uncertainties and structural uncertainties. Value uncertainties are those that result from the incomplete determination of particular values or results, while structural uncertainties are those from an incomplete understanding of the processes that control particular values or results (Solomon et al. 2007). The Fourth Assessment Report of the IPCC provides uncertainty guidance with a careful distinction between levels of confidence in scientific understanding and the likelihoods of specific results (Solomon et al. 2007). The standard terms used to define levels of confidence as given in the IPCC Uncertainty Guidance note follow:

Confidence Terminology	Degree of Confidence in being correct
Very high confidence	At least 9 out of 10 chance
High confidence	About 8 out of 10 chance
Medium confidence	About 5 out of 10 chance
Low confidence	About 2 out of 10 chance
Very low confidence	Less than 1 out of 10 chance

The standard terms used by IPCC (Solomon et al. 2007) to define the likelihood of an outcome or result where it can be estimated probabilistically are:

Likelihood Terminology	Likelihood of the occurrence/outcome
Virtually certain	Greater than 99% probability
Extremely likely	Greater than 95% probability
Very likely	Greater than 90% probability
Likely	Greater than 66% probability
More likely than not	Greater than 50% probability
About as likely as not	33 to 66% probability
Unlikely	Less than 33% probability
Very unlikely	Less than 10% probability
Extremely unlikely	Less than 5% probability
Exceptionally unlikely	Less than 1% probability

Further discussion and clarification of these standard terms and their uses is available in the 2007 IPCC Technical Summary (Solomon et al. 2007).

2.1 Global

The IPCC predicts global average surface air temperatures to increase by 1.8 to 4.0 degrees C (3.2 to 7.2 degrees F) relative to current conditions over the next century. The greatest temperature increases are expected to take place over land (roughly twice the global average temperature increases) and at high northern latitudes, with less warming over the southern oceans and North Atlantic (Meehl et al. 2007, p.749). Additionally, the IPCC predicts that it is *very likely* that heat waves would be more intense, more frequent, and longer-lasting in a future warmer climate. Decreases in frost days are projected to occur almost everywhere in the middle and high latitudes, with a comparable increase in growing season length (Meehl et al. 2007, p.750).

Precipitation is predicted to generally increase in areas of regional tropical precipitation maxima and over the tropical Pacific in particular, with general decreases in the subtropics, and increases at high latitudes. Globally averaged mean water vapor, evaporation, and precipitation are projected to increase. The intensity of precipitation events is projected to increase, particularly in tropical and high latitude areas that experience increases in mean precipitation. In areas where mean precipitation is predicted to decrease, precipitation intensity is projected to increase, with longer periods between rainfall events. A tendency is predicted for drying of the mid-continental areas during summer, indicating a greater risk of droughts in those regions (Meehl et al. 2007, p. 750).

According to the IPCC Fourth Assessment Report (Confalonieri et al. 2007), climate change related exposures of importance to human health include:

- Increase in malnutrition and consequent disorders, including those relating to child growth and development (*high confidence*)
- Increase in number of people suffering from death, disease, and injury from heatwaves, floods, storms, fires, and droughts (*high confidence*)
- Change in the range of some infectious disease vectors (*high confidence*)
- Contraction or expansion of the geographical range of malaria and change in transmission season (*very high confidence*)
- Increase in burden of diarrheal diseases (*medium confidence*)
- Increase in cardio-respiratory morbidity and mortality associated with ground-level ozone (*high confidence*)
- Increase in number of people at risk of dengue (*low confidence*)
- Some health benefits including fewer deaths from cold, although it is expected that this will be outweighed by negative effects of rising temperatures worldwide, especially in developing countries (*high confidence*)

2.2 North America

North America consists of Canada and the United States south of the Arctic Circle. Vulnerability to and impacts of climate change vary significantly from subregion to subregion and sector to sector within North America (IPCC 1997). Therefore climate change projections are discussed qualitatively.

2.2.1 Climate

Large-scale projections indicate a positive temperature change everywhere during the 21st century. This would be greatest over land and in otherwise geographically similar areas; warming is typically greater in arid as opposed to moist regions (Solomon et al. 2007, p.71). The IPCC states that North America is projected to warm between 2 to 10 degrees C (3.6 to 18 degrees F) by 2100, depending on the subregion (Christensen et al. 2007, p.889). Projected increases in Arctic temperatures in northern Alaska and Canada, uncertainties in future emissions, the climate‟s response to those emissions, and the difficulty of projecting future climate change at the regional level results in the large range in projected warming (EPA 2009b).

According to IPCC (Solomon et al. 2007, p.75), a robust pattern of increased subpolar and decreased subtropical precipitation dominates the projected precipitation pattern for the 21st century over North America with nearly all models projecting increased precipitation over most of northern North America with most of the continental U.S. in a more uncertain transition zone that moves north and south following the seasons.

During the 21st century, cities in North America that currently experience heatwaves are expected to be further challenged by an increased number, intensity, and duration of heatwaves (IPCC 2007c).

2.2.2 Water Resources

Evaluating the impacts of climate change on water resources is difficult; water availability, quality, and streamflow are sensitive to changes in temperature and precipitation; however water resources are also impacted by factors such as increased demand due to population growth, changes in the economy, new technologies, changes in watershed characteristics, and water management (EPA 2009b). In the U.S., water resources are strictly managed and water supply is scarce in some regions of the country.

According to IPCC (Christensen et al. 2007), a general increase in precipitation over most of the North American continent is projected, except in the most southwesterly region. In the western region, modest changes in annual precipitation are projected with an increase in winter precipitation and a decrease in summer. Further, it is projected that a decrease in snow depth could result from delayed autumn snowfall and earlier spring snowmelt.

2.2.3 Ecosystem

Changes in precipitation amounts and patterns can affect background soil erosion rates and soil moisture. The retreat of snow and ice cover, subsequent earlier spring snowmelt, and earlier reduction in soil moisture are important in the discussion of warming continental climates (Christensen et al. 2007).

Climate change is likely to alter the geographic distribution of North American forests (EPA 2009b). Further, effects on forests are likely to include changes in forest health and productivity. Factors affecting forest health include temperature, rainfall (amount and seasonal distribution), atmospheric levels of CO_2 and other greenhouse gases, extreme weather events, insect outbreaks, and fire. In turn these effects to forest health can alter timber production, outdoor recreation activities, water quality, wildlife, and rates of carbon storage (EPA 2009b). Land use, especially when dependant on natural resources, may be restricted or altered by climate change impacts.

2.2.4 Socioeconomics and Health

Generally, agriculture in the U.S. is projected to benefit from warming temperatures; however there will be strong regional affects with some areas losing productivity (EPA 2009b). Changes in water supply and soil moisture could make it less feasible to continue crop production in certain regions. Increased potential for extreme weather events such as droughts, floods, and heat waves will pose challenges to farmers.

The general health affects described in Section 2.1 would be applicable to North America, but developed countries such as the U.S. should be able to minimize impacts of disease through existing disease prevention and control methods (EPA 1998). As noted in Confalonieri et al. (2007), based on data from the U.S., occupations most at risk of heatstroke include construction and agriculture/forestry/fishing work.

2.3 Regional (Southwest / Arid West / Rocky Mountains)

The project area is located in south central Utah. In available regional data regarding climate change, this area falls into discussions of the many regional descriptions, including the southwest U.S. (Nevada, Utah, Colorado, New Mexico, Arizona, southeastern California), the arid west (mainly Arizona, New Mexico, Nevada, and Utah), the intermountain west (mainly Idaho, Utah, and Nevada), the Colorado Plateau (parts of Colorado, Utah, Arizona, and New Mexico), and the Great Basin/Rocky Mountains (western and northern Utah, most of Nevada, Idaho, and Wyoming, and parts of Oregon, Montana, Colorado, and New Mexico). The IPCC climate modeling in *Regional Climate Projections* (Christensen et al. 2007) was done at a continental scale but the maps produced in that work can be evaluated for regional predictions. Two region-specific studies are available: *Preparing for A Changing Climate: The Potential Consequences of Climate Variability and Change, Southwest* (Sprigg and Hinkley 2000) and *Preparing for A Changing Climate: The Potential Consequences of Climate Variability and Change, Rocky Mountain/Great Basin Regional Climate-Change Assessment* (Wagner 2003). These reports, and any subsequent region-specific report, should be consulted for more detailed information such as scenarios, methodology, and modeling. The following is a summary of potential impacts of climate change on environmental resources of the project area obtained from these reports.

2.3.1 Climate

The climate of the regions named above can be generalized as hot and dry at the low elevations to cool and moist at the high elevations. The southwest region of the U.S., which includes southern Utah, is unique in that it is under the influence of a subtropical ridge of high pressure associated with the thermal contrast between land and adjacent ocean, and as a result is very arid for most of the year.

The IPCC continental-scale modeling conducted for North America indicates warmer temperatures and generally less precipitation in the southwest U.S. on an annual basis (Christensen et al. 2007, p.850, p.887-888). For the western U.S., the IPCC modeling suggests modest changes in average annual precipitation ranging from slightly less than normal in the south to slightly greater than normal in the north. Change in winter precipitation is predicted to be variable with more winter precipitation in the northern part of the western U.S. and less in the Southwest. Summer precipitation is predicted to be less throughout the West. However, it is also noted that the continental-scale regions encompass a broad range of climates and are too large to be used as a basis for conveying quantitative regional climate change information.

The IPCC projection of less warming over the ocean than the land, and amplification and northward displacement of the subtropical anticyclone is likely to cause a decrease in annual precipitation in the southwestern U.S. (Christensen et al. 2007). According to the *Fourth Assessment Report* of the IPCC (Christensen et al. 2007), the following general climate change projections were made for the southwest U.S.:

- Seasonally, warming is *likely* to be largest in summer.
- Maximum summer temperatures are *likely* to increase more than the average summer temperature.

- Annual mean precipitation is *likely* to decrease.
- Snow season length and snow depth are *very likely* to decrease.

Wagner et al. (2003) reviewed the work of a number of climatologists, evaluated 20th century climate records for trends, and conducted two large computer models with the assumption that CO_2 concentrations would double in the 21st century to predict climate change effects in the Great Basin/Rocky Mountain (GBRM) region. They noted that use of global-scale models cannot be expected to project climate changes at localized areas with highly variable climates and great topographic variation like the GBRM area. Their modeling results showed year-round increases in temperature with the greatest increases occurring in winter. They also showed that annual precipitation was predicted to increase with the greatest increase occurring in winter.

2.3.2 Water Resources

According to the IPCC *Summary for Policymakers of the Synthesis Report of the IPCC Fourth Assessment Report* (IPCC 2007e, p.8), there is *high confidence* that by mid-century annual river runoff and water availability are projected to decrease in some dry regions in the mid-latitudes and tropics and that many semi-arid areas (i.e. southwestern United States) would experience an overall decrease in water resources due to climate change.

In most of the regions named above, stream flow largely results from spring and summer snowmelt in the mountains. Large quantities of water accumulate as snow during the historically typical winter at high mountain elevations and this water is stored as snowpack from early fall until summer. Gradual and prolonged spring and summer melting of the snowpack and movement of this water as surface streams out of the high elevations supports agricultural and urban uses of surface water. This pattern of runoff and use is supported by current water management regulations and practices including reservoirs that store spring runoff for use later in the year. In addition to surface water uses, riverbeds and mountain front alluvial fan areas are major groundwater recharge sites. The melting snow in the mountain ranges of the West provides prolonged springtime stream flows to mountain front recharge areas that recharge groundwater resources in the intervening valleys.

Changes in climate that result in overall warming of temperatures, particularly winter temperatures, can impact the hydrologic pattern described above by causing more precipitation to fall as rain instead of snow and increasing evaporation which reduces the availability of surface water and increases the summer demand for irrigation water. Increased temperatures and decreased overall precipitation would decrease the annual replenishment of surface water resources and decrease groundwater recharge. Increased temperatures combined with increased annual precipitation can still result in overall decreased water availability if less water is stored as snow and more winter precipitation occurs as rain. Under these conditions, surface water normally available later in the season from snowmelt would not be available without changes in water management practices. Lenart (2006) reviewed research by a number of hydrologists working in the western U.S. that showed the importance of prolonged stream flows from melting snowpack for groundwater recharge along the mountain fronts of the West and Southwest. The overall conclusion was that changing winter precipitation from snow to rain and reducing snowpack volume by retreating snowlines has the potential to decrease the amount of prolonged stream flow and groundwater recharge.

Udall and Bates (2007) reviewed five studies on the topics of snow water equivalent (SWE), streamflow, temperature and precipitation trends, and the proportion of rain vs. snowfall in the western states published between 2004 and 2006. The five studies were consistent in their findings of widespread warming in the West and declining snowpacks in milder climates (e.g., Pacific Northwest). Findings for the Intermountain West, however, showed few consistent, statistically significant trends. Although the Intermountain West has warmed considerably, low mean winter temperatures and increases in precipitation have protected snowpack from losses, as of 2000 (studies were done prior to the drought of 2000-2004; Udall and Bates 2007).

Wagner et al (2003) evaluated three scenarios of potential climate change effects on water availability in the GBRM area: 1) increased temperature and uniformly increased precipitation, 2) increased temperature with increased precipitation in the north and no precipitation increase in the south, and 3) increased temperature with no change or a decrease in precipitation throughout the region. Under the first scenario, they predicted a 50 to 100 percent increase in water resources which would support more urban and agricultural use but reduced snowpacks would require significant changes in water management regulations and practices, mitigation of flooding problems, and changes in reservoir capacities. Under the second scenario the conditions in the northern portion of the region would be the same as the first scenario but the southern area would experience exacerbation of the current water scarcity in that area. With the third scenario they predicted overall xerification of the region and decline in water resources forcing more conservation measures and transfer of water rights from agricultural uses to urban. Due to scarcity of water in the GBRM region, and because it is already fully appropriated, any climate change affecting water availability could have social, economic, and ecological affects, either positive or negative (Wagner 2003).

In a simulation of the impacts of several „business-as-usual" climate scenarios on the hydrology of the Colorado River Basin, Christensen et al. (2004) showed, using a water management model, that average total basin storage would be reduced by 7 percent under a control climate (1995 GHG levels) and reduced by up to 40 percent in 2098 under a „business-as-usual" scenario. The authors also discuss the high sensitivity of reservoir system performance under future climate warming due to its current „fragile equilibrium" with current system demands (Christensen et al. 2004).

By contrast, studies sponsored by the USDA Agricultural Research Service on the rate at which water filters through the vadose zone found elevated temperature and CO_2 concentrations increased the rate of groundwater recharge (USDA 2007).

2.3.3 Ecosystem

Changes in precipitation amounts and patterns (i.e., extreme weather events, flooding) can affect soil erosion rates and soil moisture. Projected increases in temperature would increase evaporation and shorten the snow season in the mountains, causing earlier spring runoff and reduced summer stream flow. Wetland habitat essential for migrating and breeding birds and fish could become reduced or degraded. Cold water aquatic species indigenous to western streams could be affected by warming temperatures as the southern limits of the species range would be forced to contract northward (Wagner 2003). Trout habitat in particular could be affected directly; some simulations predict a 50 percent reduction in Rocky Mountain trout habitat by the end of the century (NRDC 2008). The most recent Global Change Research Program Report states that about 90 percent of bull trout are projected to be lost due to warming in the coming decades (USGCRP 2009). In general, available wildlife habitat and populations could be reduced as a result of elevational and geographic contractions due to warming temperatures. Conversely, some animal populations could benefit from the warmer temperatures, including those that hibernate, which would have a longer activity period, and avian multiple-clutch species (Wagner 2003).

Changes in climate patterns such as drought, temperature, frost occurrence and duration, snow cover (or lack thereof), soil moisture, and fire occurrence and intensity can affect plant species in different ways depending on species tolerances (DeGomez and Lenart 2006). These factors directly influence seedling survival, plant growth, and seed/fruit production; therefore changes in these factors due to climate change could alter the composition of plant communities within the western U.S. Reductions in plant cover combined with intense rainfall events can cause soil erosion resulting in declines in vegetation system capacity and lags in recovery after drought (Sprigg and Hinkley 2000).

Increases in temperature can reduce water availability to forests through increasing evaporation rates, and further reductions in precipitation can cause increased susceptibility of forests to wildfire (DeGomez and Lenart 2006). The lengthening of the frost-free season can also impact the development and survival rates of insects, which can in turn change the frequency of insect outbreaks and effects on forests and vegetation.

Increases in temperature and precipitation could result in subalpine forest moving upward into alpine tundra, pinyon-juniper extending out into the shrub steppe, and the area of shrub-steppe declining (Wagner 2003). Marked changes in community composition would be probable.

2.3.4 Socioeconomics and Health

Natural-resource based economic activities are particularly sensitive to natural variations in temperature and precipitation. Livestock ranching, agriculture, and tourism/recreation are some of the major land uses in rural areas of the West. Agriculture and farm productivity are highly sensitive to weather extremes (droughts, floods, severe storms) and climate variability. Under drier or drought conditions, ranchers could face higher costs in supplemental feed, water hauling, and cattle relocation (Sprigg and Hinkley 2000). In addition, increases in carbon dioxide are reducing the quality of forage such that more acreage is needed to provide animals with the same nutritional value (US GCRP 2009). Conversely, increases in precipitation could increase yields benefiting agriculture and socio-economic stability (Wagner 2003). Recreation and tourism dependant on natural resources could be positively or negatively impacted by climate change depending on the impact to the specific resource. For example, decreased stream flow could negatively impact fishing and other water sports; decreased snowpack and early snowmelt could negatively impact the ski industry; warmer temperatures and longer warm seasons could positively impact sightseeing, hiking, and other outdoor activities.

Incidence of diseases such as Hantavirus and valley fever has been linked to weather and precipitation patterns. Sequences of rain-drought-rain can produce outbreaks of Hantavirus and cases of valley fever are reported to increase in unusually wet seasons (Sprigg and Hinkley 2000).

2.4 Utah

The Blue Ribbon Advisory Council (BRAC) on Climate Change was organized by Governor Jon M. Huntsman, Jr. on August 25, 2006, to provide a forum where government, industry, environment, and community representatives could identify proactive measures that Utah might take to mitigate the impacts of GHG. The following is taken largely from a Scientific Consensus Report (BRAC 2007: Appendix A), as part of the BRAC report, that summarizes present scientific understanding of climate change and its potential impacts on Utah and the western United States. The Scientific Consensus Report was prepared by scientists from the University of Utah, Utah State University, Brigham Young University, and the U.S. Department of Agriculture, and emphasizes the consensus view of the national and international scientific community with discussion of confidence and uncertainty as defined by the BRAC (BRAC 2007: Appendix A).

2.4.1 Climate

In Utah, the average temperature during the past decade was higher than observed during any comparable period of the past century, and roughly 2º F higher than the 100-year average. Utah is projected to warm more than average for the entire globe and more than coastal regions of the contiguous United States. The expected consequences of this warming are fewer frost days, longer growing seasons, and more heat waves (BRAC 2007: Appendix A).

2.4.2 Water Resources

Most of Utah's water resources originate in mountainous areas above 6,500 feet in elevation, which cover about 19 percent of the state (BRAC 2007). The primary source of this water is snowpack, which releases months of stored precipitation in about 4 to 8 weeks during spring and summer, as described in Section 2.3.2. Clear and robust long-term snowpack declines have yet to emerge in Utah"s mountains, as they have in low-elevation mountains in other states (i.e., in the Pacific Northwest and California). In addition, recent temperature increases in Utah appear to have had little impact on snowpack in the high mountains of the Intermountain West. Streamflows in Utah and the Intermountain West also do not show clear trends over the past 50 years. Dai et al. (2009), who studied flow history of 925 of the world"s largest rivers, including the Colorado River in southern Utah, pointed out that flow data included changes induced by human activities, such as the withdrawal of stream water and building dams (Dai et al. 2009). High water usage in Utah and its effect on flow data thus complicates the relationship that can be deduced between flow and climate change. Regardless, studies of precipitation and runoff over the past several centuries and climate model projections for the next century indicate that ongoing GHG emissions at or above current levels will likely result in a decline in Utah"s mountain snowpack, thus the threat of severe and prolonged episodic drought in Utah is real (BRAC 2007). If temperatures increase as projected, it is likely that a greater fraction of precipitation will fall as rain instead of snow, the length of seasonal snow accumulation will decrease, and snowpack loss due to evaporation will increase, as predicted for the region (Section 2.3.2).

Precipitation in Utah during the 20th century was unusually high, but also fluctuates dramatically, further complicating the identification of long term trends. Using geologic records and tree rings, Woodhouse and others (Woodhouse and Lukas 2006; Woodhouse et al. 2006) have reconstructed river flow and precipitation in the Colorado River Basin for the last several centuries. Their estimates show that sustained droughts are a defining feature of the upper Colorado River Basin, which has experienced far more prolonged and severe drought than observed during the comparatively wet 20th century. The drought of 1999-2004 was a severe event, but there have been even longer and more severe droughts in the past, such as in the 16th century (BRAC 2007). However, if average precipitation remains similar to that of the 20th century, changes in snowpack will result in a declining water supply. Current climate models project a decline in summer precipitation across all of Utah (BRAC 2007).

2.4.3 Ecosystem

Forests are generally adapted to recent climatic conditions and variability (see Hamrick 2004), but the rate of temperature change expected during the next century will greatly exceed that produced naturally over the past several thousand years. Apart from other human-related factors such as forest management practices and land-use changes, future climate change is likely to contribute to drier conditions in Utah forests as well as increased wildfire intensity, more insect outbreaks and reduced forest health.

Droughts in Utah have exacerbated declining forest health across the state, and consequently Utah"s forests have become more susceptible to intense wildfire, insects, and disease (UDNR 2003). The ecological impacts of wildfires as well as forest pests and diseases are expected to rise with climate warming, with extended periods of high fire risk and large increases in area burned (IPCC 2007b; USGCRP 2009). A study of historical spruce beetle outbreaks on the Markagunt Plateau revealed that small-scale disturbances have been the norm over the past century, and that large-scale outbreaks occurring in recent history (in the early 1990s, in this study) are an unprecedented phenomenon (DeRose and Long 2007).

The Forest Service also reports that rising levels of atmospheric carbon dioxide could help the spread of invasive weeds such as Canada thistle, yellow starthistle, leafy spurge, spotted knapweed, field bindweed, and perennial sowthistle (Ziska 2003).

Utah soils are expected to dry more rapidly due to increasing temperatures, which will likely increase soil vulnerability to wind erosion. This will increase dust transport during high wind events, particularly from salt flats and dry lake beds such as Sevier Lake. Dust deposited on mountain snowpack also accelerates spring snowmelt (BRAC 2007).

2.4.4 Socioeconomics and Health

The population of the Intermountain West (eight states including Utah) is projected to increase by 65 percent from 2000 to 2030, representing one-third of all U.S. population growth (USGCRP 2009). Between 2000 and 2005, Utah was among the five fasted growing states in the U.S. (US GCRP 2008). Projections of decreased snowpack and earlier spring melting suggest lower stream flows in the future, particularly during the high-demand period of summer (USGCRP 2008). There is a high likelihood that water shortages will limit power plant electricity production in many regions, and constraints in production by 2025 are projected in ten states including Utah (USGCRP 2009).

Poor air quality in Utah is currently and has been a historic problem (data at UDAQ 2009), and as forest fires increase in frequency, severity, distribution, and duration, so may their associated adverse pulmonary effects (USGCRP 2008).

As discussed in Section 2.3.4, climate warming impacts on agriculture may be both adverse and beneficial. Based solely on climate change, per-acre crop yields in Utah will likely increase on irrigated fields provided: (1) water remains available for irrigation, and (2) temperatures do not increase beyond crop tolerance levels. Pasture yields and livestock forage will likely decline on non-irrigated fields. Climate change may also have indirect effects on crop yields through changes in the distribution and population of insects and animals, which affects pollination and crop damage.

3.0 Emissions Estimates for Anthropogenic Greenhouse Gas Emissions

This section provides a quantitative analysis of projected GHG emissions that could occur as a result of the connected actions associated with a leasing decision and the Reasonable Foreseeable Development Scenario (RFDS; i.e., hypothetical oil and gas activities projected for the next 30 years). In addition to the quantitative analysis it describes some of the uncertainties inherent in calculating these quantities, and demonstrates the additional difficulties caused by the lack of a universally sanctioned methodology for determining emissions and the atmosphere‟s sensitivity to GHG emissions. Despite these uncertainties, the quantitative analysis puts the project in perspective compared with other areal and temporal scales.

3.1 Methodology and Uncertainty

Calculating or measuring greenhouse gas emissions is not a simple task. Smoke stack emission tests are reasonably accurate, but vary over time depending on climate, production, and other variables. Emissions from non-point sources, such as motor vehicles, vary based on the octane, additives, catalytic converters, operating temperature, and other variables. Data for older point sources may be available for emissions included under National Ambient Air Quality Standards (NAAQS), such as sulfates and nitrates, but not for greenhouse gases, such as nitrous oxide and methane. As an example, in its *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2007* (EPA 2009a), the Environmental Protection Agency (EPA) estimates the range of uncertainty in its 2007 data for GHG emissions from "fossil fuel combustion" to be only -2 percent to 5 percent for CO_2, but -34 percent to 128 percent for "stationary combustion" of methane and -24 percent to 187 percent for "stationary combustion" of nitrous oxide. Ambient air samples can be affected by uneven mixing, upwind sources, deposition, and other variables.

One of the most widely used methods for estimating emissions is the use of emission factors. Used by EPA, Department of Energy (DOE), the IPCC and others, emission factors are based on test data of emissions meeting certain testing quality standards. Emission factors represent the average emission rate for a given source, and are generally expressed as a mass or volume of emissions per source type or measure of activity related to the source (API 2009). Published emission factors (by regulators) are based on the "average" fuel carbon content (when measuring CO_2) or the average equipment characteristics (when measuring CH_4 or N_2O). Equipment manufacturer emission factors are based on engine type, air/fuel ratios and fuel type (when measuring CO_2) or are closely related to equipment characteristics (in the case of CH_4 and N_2O; API 2009). Emission factors are source-specific and thus are summed, according to the rate of activity (i.e., consumption) for each, to calculate the total emissions of a proposed action or set of actions.

In addition to the uncertainties inherent in estimates of emissions to the atmosphere from anthropogenic sources, including both greenhouse gases and aerosols, there is the additional uncertainty of how the earth"s climate will react to "radiative forcing," or "global mean change in energy balance imposed over time by changes in atmospheric composition and other influences such as land use" (Schwartz et al. 2007a). The current uncertainty estimate by the IPCC (2007b) has been criticized by Schwartz et al. (2007a) for not accounting for the full range of radiative forcing; however, see responses by IPCC (Forster et al. 2007) and Schwartz et al. (2007b). Oppenheimer et al. (2007) also criticize the IPCC for excluding in their uncertainty calculation the so-called "wild cards" of climate change, or highly tentative but potentially catastrophic events (e.g., melting of West Antarctic ice sheets). However, the IPCC estimate in the Fourth Assessment Report makes use of clearly defined levels of confidence in scientific understanding and the likelihoods of specific results in their predictions, such that processes which have limited data or poor predictability would not be included (Le Treut et al. 2007).

A protocol for determining greenhouse gas emissions and their effect has been developed by the World Resources Institute and the World Business Council for Sustainable Development,. The "GHG Protocol for Project Accounting" (GHG Protocol Initiative 2005) has a companion, 17-page protocol titled "GHG Protocol guidance on uncertainty assessment in GHG inventories and calculating statistical parameter uncertainty." (GHG Protocol Initiative 2003)

To summarize, quantification and estimation of greenhouse gas emissions and their effect is influenced by uncertainty encountered and compounded at multiple levels, from measurement of emissions to predicting the long-term effects of future emissions or the possibilities of catastrophic events. This is not to say that there is no value in attempting to quantify the emissions and their effects, but rather a caution against drawing definite conclusions from indefinite data and science. In addition, uncertainty estimates are conservative due to the use of only well-established science.

3.2 Quantitative Analysis

At the national and world levels the most recent available data are for 2007, so 2007 data are shown for most tables. Where available, methane and nitrous oxide emissions are shown as CO_2 equivalent, but in most cases, only CO_2 is available in published data. In all cases, units and sources are provided.

3.2.1 Dixie NF Oil and Gas Activities: Greenhouse Gas Emission Profile

This section contains an estimate of the yearly greenhouse gas emissions that could result from connected actions to the leasing decision and the RFDS, under any of the Dixie National Forest Oil and Gas Leasing EIS action alternatives. Annual emissions estimates for these predicted oil and gas activities are described in **Appendix SIR-2A**. This section contains a summary of the assumptions and methods used to arrive at these estimates.

The specific oil and gas activities predicted in the RFDS that could contribute to GHG emissions are listed below:

- Exploration drilling
- Production operations- drilling and pumping
- Transportation of crude oil from field to refinery
- Refining of crude oil into final product
- Transportation of final product to end user
- End use of product

Emissions from seismic exploration are not analyzed due to the relatively small contribution of these emissions to the total, and because seismic exploration could occur outside of the action alternatives. Transportation of rigs to and from the exploration and production sites (unknown distances), as well as average daily traffic related to exploration and production activities (discussed in Section 4.10.3 of the EIS), were not included in emission calculations. Including emissions from refining, transportation of refined product, and product end use is a conservative impact estimate because these emissions may occur regardless of the product source in order to satisfy current and future market conditions, and it could be argued that these actions are not necessarily related to oil and gas production on the Dixie National Forest.

Total emissions estimates for each predicted oil and gas activity (i.e., connected action) are summarized in **Table 3.2-1**. Emissions are reported in metric tons of Carbon Dioxide Equivalent (CO_{2e}) which is the standard unit of measure established by the EPA for GHG emissions. Non-CO_2 gases were converted to CO_{2e} by multiplying by the Global Warming Potential for each gas.

Table 3.2-1 Estimated Emissions for Connected Actions to Leasing (Metric Tons)

Oil and Gas Activity	CO_{2e}
Exploration	9,993
Production	43,443
Transportation of Crude	2,161
Refining	21,019
Transportation of Refined	868
Product End Use (off-site)	268,312
TOTAL	**345,796**

The general calculation method used to determine the emissions (i.e., emission rate) from each individual activity (source) was the following:

Emission factor * Rate of Use = Emission Rate (metric tons of CO_2 per year)

Detailed calculations and assumptions are described for each predicted oil and gas activity in **Appendix SIR-2A**. The general approach and assumptions made for each connected action are summarized below.

Exploration

Exploratory drilling is predicted to occur at unspecified locations in the Forest as part of the RFDS. GHG emissions estimates were developed utilizing the impacts of a single diesel fueled drill rig operation that will be able to drill and complete three exploratory wells per year. Each well was assumed to take approximately 90 days to drill and assumed 24 hour per day operation. In addition to direct drill rig emissions, a conservative assumption was made that natural gas encountered during drilling would be flared at the drill site. GHG flare emissions were calculated assuming a flare combustion efficiency of 98 percent, and the 2 percent of non-combusted natural gas was estimated to be composed of 90 percent methane. The emissions from this non-combusted portion were also reported.

Emissions were calculated utilizing emission factors from the Mandatory Greenhouse Gas Reporting final rule, 40 CFR Chapter I Subchapter C Part 98 Subpart C Table C-1.

Production

The estimate of production GHG emissions sought to predict maximum potential GHG emissions and therefore assumed that a full 20-well production field was already in place for the production emissions scenario (a theoretical 20-well production field is used in other analyses for the EIS). The theoretical production field was comprised of 20 active oil well pumps fueled by diesel fuel. Emissions for natural gas and electric-fueled well pumps were also developed, but diesel was utilized during this analysis as it produced the highest GHG emissions per barrel of oil developed. For conservatism, the field was assumed to contain 20 heater/treater apparatus (one for each well location), a central natural gas fired compressor, two natural gas dehydrators, and a single production flare. The field also included ongoing drilling operations for either exploration or additional production well development. In addition to combustion GHG emissions during the production phase, fugitive methane emissions from production equipment were also estimated.

The emission factors inherent to the calculations were sourced from 40 CFR Chapter I Subchapter C Part 98 Subpart C Table C-1.

Transportation of Crude

It is assumed that a likely destination for the crude oil would be a refinery in the Salt Lake City area. The RFDS predicts that the oil field would produce about 2,000 barrels per day of crude oil. A 365 day per year production would yield an estimated 730,000 bbl annually. The distances from several random points on the Dixie National Forest (the location of a predicted well is unknown) to the nearest Salt Lake City refinery were calculated, and the numerical average of these distances was 300 miles. A total of 2,491 trips per year by a “heavy-duty vehicle” were estimated (see **Appendix SIR-2A**). The primary GHG emissions resulting from transport of crude oil to the refinery is CO_2. In addition to the GHG emissions caused by mobile combustion during transport, fugitive methane emissions from loading and unloading tanker trucks as well as tanker truck vents were estimated.

Transportation emission factors were taken from the World Resources Institute GHG Protocol tool for mobile combustion.

Refining

Emissions were estimated based on a crude oil life cycle case study published in the Oil and Gas Journal.

An average emission factor from five crude oil life cycle case studies was used to estimate refining emissions.

Transportation of Refined Product

After the crude oil is refined into a final product, it is assumed to be transported via tanker truck to terminals for final distribution and end use. The average one-way distance from the representative Salt Lake City refinery to the end user is assumed to be 150 miles. The majority of the product is assumed to be gasoline, distillate (diesel) fuel, jet fuel and residual fuel oil that would be transported to market in tanker trucks. Assuming a lead tank truck with pull trailer configuration with an average capacity of 13,400 gallons equates to a total of 2,066 trips per year by a “heavy-duty vehicle.”

Transportation emission factors were taken from the World Resources Institute GHG Protocol tool for mobile combustion.

Product End Use

Product end use is the largest contributor to the Dixie National Forest oil and gas predicted activities emissions (>75 percent of total; see **Table 3.2-1**). Product end use also assumes a demand for refined oil and gas products, which would be independent of any Dixie National Forest oil and gas production. However, product end use must be taken into account in the emission scenario because the demand does exist, due to the need for these fuels and the relatively low price of refined oil and gas products compared to alternative fuels currently available. It can reasonably be assumed, therefore, that if the Dixie National Forest were to discover and produce oil and gas products, they would be used.

For the analysis of product end use, only CO_2 emissions estimates are included because N_2O and CH_4 emissions comprise a relatively small proportion of overall combustion or oxidation emissions of the subject products.

The following product mix was assumed:

- 49.2% motor gasoline
- 24.9% distillate fuel
- 7.8% jet fuel
- 5.1% residual fuel oil
- 3.3% liquid petroleum gas
- 3.2% still gas
- 6.5% other, mostly unfinished oil and coke (not burned)

The end use emission calculations utilized 40 CFR Part 86 equation MM-1 and emission factors from Table MM-1.

3.2.2 Baseline Condition

No new leasing decisions and no new oil and gas leasing are currently occurring on the Dixie National Forest. Due to the current demand for refined oil and gas products, it is reasonable to assume that under the current management scenario (i.e., no new leasing) an approximation of the emission scenario described in Section 3.2.1 would occur in another location off the Dixie National Forest, as oil and gas resources are produced for refinement and use.

This section describes the GHG emissions and sinks associated with baseline conditions and management activities on the Dixie National Forest. These conditions and activities would also occur regardless of any leasing, thus the following carbon emissions scenario is independent of the leasing decision.

Estimates of carbon stock (sequestration) and carbon emissions on the Dixie National Forest have not been calculated. However, some estimates have been made for other National Forests in the west, and the EPA has estimated carbon output from "forest ecosystems" in the U.S. and as well as from forest fires. These data are presented below to provide a rough approximation of the Dixie National Forest carbon stock, and GHG emissions from Dixie National Forest operations and forest fires under normal (i.e., baseline) management.

Forest Carbon Stock Estimates

Estimates of carbon sequestration or carbon sinks have not been prepared for the Dixie National Forest. Such estimates have been prepared by the EPA for forest ecosystems in the U.S. (EPA 2008a) and are discussed in a document released by the USFS Northern Research Station (NRS 2009). These estimates include the overall carbon stock balance of carbon sequestered in forest media, wood products in use, and wood in solid waste disposal facilities. These estimates are shown in **Table 3.2-2**.

Table 3.2-2 Carbon Stocks in the U.S. Forest and Harvested Wood Pools (Million Metric Tons)

Carbon Pool	1990	1995	2000	2005	2006	2007
Forest	**40,106**	**40,810**	**41,535**	**42,308**	**42,481**	**42,654**
Above Ground Biomass	14,547	14,955	41,535	42,308	42,481	42,654
Below Ground Biomass	2,896	2,974	3,063	3,167	3,189	3,211
Dead Wood	2,453	2,515	2,592	2,664	2,679	2,695
Litter	4,557	4,641	4,680	4,738	4,753	4,769
Soil Organic Carbon	15,652	15,725	15,795	15,817	15,826	15,835
Harvested Wood	**1,862**	**2,033**	**2,193**	**2,332**	**2,362**	**2,392**
Products in Use	1,231	1,311	1,382	1,436	1,448	1,461
Solid Waste	631	722	810	896	913	931
Total Carbon Stock	**41,968**	**42,843**	**43,728**	**44,640**	**44,843**	**43,376**

When the carbon stock information is combined with the estimated GHG emissions from forest ecosystems, EPA (2008a) estimated the amount of CO_2 that is sequestered annually in the U.S., as shown in **Table 3.2-3**.

Table 3.2-3 Net Annual Changes in U.S. Carbon Stocks (Metric Tons CO_2/year)

Carbon Pool	1990	1995	2000	2005	2006
Forest	(489.1)	(540.5)	(436.8)	(635.1)	(635.1)
Harvested Wood	(132.6)	(119.4)	(113.9)	(108.5)	(110.0)
Total Net Flux	(621.7)	(659.9)	(550.7)	(697.3)	(698.7)

It is assumed that the overall carbon stock balance for the Dixie National Forest follows the national trend described by the EPA, in that carbon is being sequestered in both the Forest ecosystem and harvested wood obtained from the Forest, and that this is resulting in a net sequestration of CO_2 on an annual basis.

GHG Emissions from Forest Operations

The Dixie National Forest has not conducted a Forest-specific estimate of GHG emissions from normal forest management activities. In July 2009 the USFS published its first estimates of GHG emissions for six national forests in the Greater Yellowstone Area (USFS 2009). The inventory only addressed anthropogenic emissions during fiscal year 2007 from the six National Forests, and did not include carbon sequestration or carbon sinks. The inventory estimated GHG emissions generated by Forest Service activities in Fiscal Year 2007 on the following six National Forests in the Greater Yellowstone Area: Bridger-Teton, Beaverhead-Deerlodge, Caribou-Targhee, Custer, Gallatin, and Shoshone. The results of the inventory are shown in **Table 3.2-4**.

Table 3.2-4 Fiscal Year 2007 Emissions by Source Category for Each Greater Yellowstone Area Forest (Metric Tons CO_{2e})

Source	Beaverhead-Deerlodge	Bridger-Teton	Caribou-Targhee	Custer	Gallatin	Shoshone
Mobile Sources	526	1,050	1,270	170	772	797
Purchased Electricity	457	558	326	128	275	170
Stationary Sources	322	287	247	69	218	123
Employee Commuting	13	164	245	39	184	91
Business Air Travel	13	22	28	11	21	11
Total	1,332	2,080	2,117	417	1,469	1,190

Although the Dixie National Forest has not conducted a greenhouse gas emissions inventory of its own operations, it is likely within the range included in the emissions estimates for the six national forests in the Greater Yellowstone Area.

GHG Emissions from Forest Fires

A significant amount of GHG is emitted from forest fires. EPA (2008b) estimated GHG emissions from forest fires in the U.S., at shown in **Table 3.2-5**.

Table 3.2-5 GHG Emissions from Forest Fires in the U.S. (Million Metric Tons)

GHG	1990	1995	2000	2003	2004	2005	2006
CO_2	48.8	51.3	207.2	95.4	75.5	134.3	267.9
CH_4	4.5	4.7	19.0	8.7	6.9	12.3	24.6
N_2O	0.5	0.5	1.9	0.9	0.7	1.2	2.5

In California, Bonnicksen (2008) used the Forest Carbon and Emissions Model to estimate GHG emissions from forest fires (Bonnicksen 2008). Bonnicksen studied four California wild fires that burned a total of 144,825 acres and were found to have released about 9.5 million tons of GHG emissions from combustion, or about 63 tons per acre. This was based on a tree density of about 273 trees per acre. It was calculated that this GHG emission rate would have been lowered to about 12 tons per acre for a tree density of about 60 trees per acre. However, GHG emissions from eventual decay of wood and plant materials caused by the fires was calculated to be roughly three times that of combustion alone, increasing the total GHG emissions from the fires to about 38 million tons over the next 50 to 100 years. This is because forests emit more GHG when they decay than when they burn because large quantities of biomass remain in the forest after combustion. The total GHG emissions from these four fires was calculated to be roughly equivalent to about seven million cars driving in California for one year.

The Dixie National Forest has experienced forest fires in the past and will continue to do so in the future. The extent and severity of wildfires on the Forest cannot be predicted, and neither can the GHG emissions from these events. However, GHG emission estimates that have been made nationally and in other states have shown that forest fires are significant sources of GHG emissions, and forest fires on the Dixie National Forest would also produce large quantities of GHG emissions.

3.2.3 Greenhouse Emissions in Utah and Regionally

This section presents GHG emissions data for the State of Utah and regionally as a means of putting estimated emissions from connected actions to the leasing decision in context. Where available, data include both GHGs from all major sources (electricity generation, transportation, agriculture, industry, and landfills).

Utah

The largest source of GHG emissions in Utah is electric power generation (CCS 2007). Over 90 percent of electric power emissions in Utah are from burning coal (**Table 3.2-6**). The largest (coal-fired) power plant and producer of CO_2 emissions in Utah is Intermountain [i.e., Intermountain Power Project in Delta, Utah] (EIA 2009; EPA 2008b). Intermountain accounts for about 40 percent of Utah"s GHG emissions on a production basis (EPA 2008b). The top producer of electricity in Utah is PacifiCorp, an electric power company, which produced 80 percent of total electricity generated in Utah in 2007 (22,353,159 megawatt hours; EIA 2009). **Table 3.2-6** shows CO_2 emissions from the Utah electric power industry by fuel source for 2007. Note that these estimates may differ slightly from the U.S. Inventory data (i.e., 38.44 vs. 37.09 for Electric Power in **Table 3.2-7**) due to methodological differences, including scope of coverage, underlying data, and assumptions (see EPA 2009c).

Table 3.2-6 Utah Electric Power Industry CO_2 Emissions by Fuel Source

Fuel Source	2007 CO_2 ($MMTCO_2$)	2007 Percent of Total
Coal	35.10	91
Petroleum	0.03	<0.1
Natural Gas	3.30	9
Geothermal	0.004	<0.1
Total	**38.44**	**100**

Source: (EIA 2009)

Table 3.2-7 shows CO_2 emissions from fossil fuel combustion in all consumption sectors for Utah, given in million metric tons of CO_2 ($MMTCO_2$) by sector (EPA 2009c). Note that this table does not show all greenhouse gas emissions, only CO_2, which EPA estimates to "represent 80 percent of total U.S. greenhouse gas emissions" (EPA 2009a).

Table 3.2-7 Emissions from Fossil Fuel Combustion by Consumption Sector for Utah

Sector	1995 ($MMTCO_2$)	2000 ($MMTCO_2$)	2007 ($MMTCO_2$)	2007 Percent of Total
Commercial	1.41	2.05	2.22	3
Industrial	3.06	10.30	8.03	12
Residential	1.33	3.28	3.61	5
Transportation	11.42	15.63	18.28	26
Electric Power	18.19	32.51	37.09	54
Total	**35.40**	**63.78**	**69.23**	**100**

Source: (EPA 2009c)

Based on EPA‟s estimate that CO_2 emissions represent 80 percent of greenhouse gas emissions, it can be estimated that total greenhouse gas emissions for 2007 in Utah were 86.5 million metric tons GHG (69.2 MMT CO_2 ÷ 0.80 = 86.5 MMT). Note that this is not CO_2 equivalent, which cannot be determined without knowing the relative proportions of the non-CO_2 gases, which vary not only by fuel type but the specific source of the fuel (e.g. subituminous coal from different states).

Region

In the atmosphere, pollutants can accumulate in stationary air masses, then move with the air mass to another location. The American Meteorological Society (AMS) defines "regional air pollution" as follows:

> Pollutants that have been emitted from all sources in a region and have had time to mix, diffuse from their peak concentration, and undergo physical, chemical, and photochemical reactions. The size of a region is indeterminate, but usually incorporates one or more cities, and is on the order of 100 to 10 000 km2. (AMS 2008)

An air mass is a "widespread body of air, the properties of which can be identified as 1) having been established while that air was situated over a particular region of the earth‟s surface, and 2) undergoing specific modifications while in transit away from the source of origin. (AMS 2008) Air masses relatively homogeneous horizontally, particularly with respect to temperature and humidity. Vertically, temperature and moisture variations are approximately the same over the horizontal extent of the air mass.

Air masses form through prolonged contact with a relatively uniform region, such as an ocean or flat land area; these are classified as marine or continental air masses (Whiteman 2000). Regional air masses are also classified as tropical or polar, among others. Whiteman notes "in the United States, the topography is too varied (for air masses to form). Instead, the midlatitudes are a region where clashing air masses meet." (Whiteman 2000) In Utah, those air masses are most often either continental tropical (summer only; from Mexico) or continental polar (from the Northwest Territory in Canada) (Whiteman 2000).

Utah is part of several "regions," including the Great Basin, the Rocky Mountains, and the Colorado Plateau. For the purposes of analysis in this section, the following states will be compared and defined as the "seven-state region": Utah, Nevada, Idaho, Wyoming, Colorado, New Mexico, and Arizona. These states share many climatic, ecological, and population attributes.

Table 3.2-8 shows 2007 emissions from fossil fuel combustion by sector for the seven-state region described above, as well as their regional total CO_2 emissions. The table also shows population (2008 estimate) and per capita CO_2 emissions from fossil fuel combustion from these data. The data show that Utah, at 25.3 metric tons per capita, has the third highest emission per capita of CO_2 from combustion of fossil fuel in the region. The national per capita rate was 19.2 metric tons for 2008 (see **Table 3.2-14** below). As of 2005, Utah"s gross CO_2 emissions are rising at a faster rate than those of the nation (EPA 2008b). By 2020, Utah"s gross CO_2 emissions are projected to climb to 96.1 MMt CO_2, which is 95 percent above 1990 levels (53.8 MMt CO_2 in 1990, EPA 2009c; gross emissions=69.2 MMt CO_2 in 2007; **Table 3.2-8**).

Table 3.2-8 Regional CO_2 Emissions from Fossil Fuel Combustion 2007

2007 CO_2 Emissions (MMT)								
Sector	**Utah**	**NV**	**ID**	**WY**	**CO**	**NM**	**AZ**	**Region**
Commercial	2.2	1.7	1.0	0.8	3.8	1.5	2.1	13.2
Industrial	8.0	2.8	3.4	11.0	13.1	8.6	4.9	51.9
Residential	3.6	2.3	1.6	0.9	7.7	2.2	2.3	20.7
Transportation	18.3	18.1	9.5	8.8	31.1	15.4	37.5	138.7
Electric Power	37.1	16.6	0.7	43.1	42.4	30.8	54.7	225.4
Total	**69.2**	**41.6**	**16.3**	**64.6**	**98.1**	**58.6**	**101.5**	**449.9**
% of Region	15	9	4	14	22	13	23	100
Population (2008 est)	2,736,424	2,600,167	1,523,816	532,668	4,939,456	1,984,356	6,500,180	20,817,067
CO_2 Emission per Capita	25.3 metric tons	16.0 metric tons	10.7 metric tons	121.2 metric tons	19.9 metric tons	29.5 metric tons	15.6 metric tons	21.6 metric tons

Source: EPA 2009c; U.S. Census Bureau 2009

3.2.4 United States

The EPA tracks GHG emissions in the U.S. by source sector (e.g., industrial, land use, electricity generation, etc), fuel source (e.g., coal, natural gas, geothermal, petroleum, etc), and economic sector (e.g., residential, transportation, commercial, agriculture, etc). Data are further refined by the emissions (e.g., carbon dioxide, methane, nitrous oxide, etc) and their CO_2 equivalent. With so many GHG emission sources nationally, from cows to tailpipes to electric power generators, no single source is likely to represent a significant percentage of national emissions. Nevertheless, in the context of NEPA and disclosure of potential impacts, GHG emissions for the U.S. are provided here in several ways. **Table 3.2-9** shows GHG emissions (in CO_2 equivalent) by economic sectors for 1995, 2000, and 2007. **Table 3.2-10** shows total U.S. emissions in 1995, 2000 and 2007 by gas and source and by CO_2 equivalent, only the largest sources/sinks are shown for each gas. Note that for CO_2 "Land Use, Land-Use Change, and Forestry represents a sink rather than a source, and is therefore in parentheses.

Table 3.2-9 U.S. Greenhouse Gas Emissions Allocated to Economic Sectors (MMT CO_{2e})

Implied Sectors	1995 (MMT CO_{2e})	2000 (MMT CO_{2e})	2007 (MMT CO_{2e})
Electric Power Industry	1,989.0	2,329.3	2,445.1
Transportation	1,685.2	1,919.7	1,995.2
Industry*	1,524.5	1,467.5	1,386.3
Agriculture	453.7	470.2	502.8
Commercial	401.0	388.2	407.6
Residential	368.8	386.0	355.3
U.S. Territories	41.1	47.3	57.7
Total Emissions	**6,463.3**	**7.008.2**	**7,150.1**
Land Use, Land-Use Change, and Forestry (Sink)	(851.0)	(717.5)	(1,062.6)
Net Emissions (Sources and Sinks)	**5,612.3**	**6,290.7**	**6,087.5**

Source: EPA 2009a; *includes Natural Gas Systems and Petroleum Systems.

Table 3.2-10 U.S. Greenhouse Gas Emissions and Sinks (MMT CO_{2e})

Gas/Source	1995 (MMT CO_{2e})	2000 (MMT CO_{2e})	2007 (MMT CO_{2e})
CO_2	**5,407.9**	**5,955.2**	**6,103.4**
Fossil Fuel Combustion	5,013.9	5,561.5	5,735.8
Non-Energy Use of Fuels	137.5	144.5	133.9
Cement Manufacture	36.8	41.2	44.5
Iron and Steel Production and Metallurgical Coke Production	103.1	95.1	77.4
Natural Gas Systems*	33.8	29.4	28.7
Petroleum Systems*	0.3	0.3	0.3
Land Use, Land-Use Change, and Forestry (Sink)	(851.0)	(717.5)	(1,062.6)
CH_4	**615.8**	**591.1**	**585.3**
Landfills	144.3	122.3	132.9
Enteric Fermentation	143.6	134.4	139.0
Natural Gas Systems	132.6	130.8	104.7
Coal Mining	67.1	60.5	57.6
Manure Management	34.5	37.9	44.0
Petroleum Systems	32.0	30.3	28.8
N_2O	**334.1**	**329.2**	**311.9**
Agricultural Soil Management	202.3	204.5	207.9
Mobile Combustion	53.7	52.8	30.1
Nitric Acid Production	22.3	21.9	21.7
Stationary Combustion	13.3	14.5	14.7
Manure Management	12.9	14.0	14.7
HFCs, PFCs, and SF_6	**105.5**	**132.8**	**149.5**
Substitution of Ozone Depleting Substances	28.5	71.2	108.3
HCFC-22 Production	33.0	28.6	17.0
Electrical Transmission and Distribution	21.6	15.1	12.7
Total Emissions	**6,463.3**	**7.008.2**	**7,150.1**
Net Emissions (Sources and Sinks)	**5,612.3**	**6,290.7**	**6,087.5**

Source: EPA 2009a; *Combusted CO_2 emissions from Natural Gas and Petroleum Systems are accounted for in the Fossil Fuels Combustion source category.

Non-combustion CO_2 and CH_4 emissions for Natural Gas Systems (as shown in **Table 3.2-10**) are generally process-related, with normal operations (e.g., from natural gas engines and turbine uncombusted exhaust), routine maintenance (i.e., from pipelines, equipment, and wells during maintenance), and system upsets (e.g., from pressure surge relief systems and accidents) being the primary contributors (EPA 2009a). Emissions from the four major stages of Natural Gas Systems are shown in **Table 3.2-11**.

Non-combustion CO_2 emissions for Petroleum Systems (as shown in **Table 3.2-10**) are primarily associated with crude oil production and are negligible in the transportation and refining operations. Non-combustion CH_4 emissions are associated with all three activities, during which CH_4 emissions are released as fugitive emissions, vented emissions, and emissions from operational upsets (EPA 2009a). Emissions from the three major stages of Petroleum Systems are shown in **Table 3.2-11**.

Table 3.2-11 U.S. GHG Emissions Related to Natural Gas Systems, and Petroleum Systems

Gas/Source	GHG 1995 (MMT CO_{2e})	GHG 2000 (MMT CO_{2e})	GHG 2007 (MMT CO_{2e})
CO_2	5,407.9	5,955.2	6,103.4
Natural Gas Systems	**33.8**	**29.4**	**28.7**
Field Production	9.1	6.0	7.4
Processing	24.6	23.3	21.2
Transmission and Storage	0.1	0.1	0.1
Distribution	--	--	--
Petroleum Systems	**0.3**	**0.3**	**0.3**
Production Field Operations	0.3	0.3	0.3
Crude Oil Transportation	**--**	**--**	**--**
Refining	**--**	**--**	**--**
CH_4	615.8	591.1	585.3
Natural Gas Systems	**132.6**	**130.8**	**104.7**
Field Production	38.7	40.3	22.4
Processing	15.1	14.5	12.3
Transmission and Storage	46.4	44.6	40.4
Distribution	32.4	31.4	29.6
Petroleum Systems	**32.0**	**30.3**	**28.8**
Production Field Operations	31.3	29.6	28.1
Crude Oil Transportation	0.1	0.1	0.1
Refining	0.5	0.6	0.6

Source: EPA 2009a

Indirect greenhouse gases do not have a direct global warming effect, but indirectly affect terrestrial radiation absorption by influencing the formation and destruction of tropospheric and stratospheric ozone, or in the case of SO_2, the absorptive characteristics of the atmosphere. Additionally, some of these gases may react with other chemical compounds in the atmosphere to form compounds that are greenhouse gases (EPA 2009a). Oil and gas activities are among the energy sources that contribute indirect GHG emissions to the atmosphere; these amounts are listed in **Table 3.2-12**.

Table 3.2-12 Indirect U.S. GHG Emissions Related to Oil and Gas Activities

Gas/Source	GHG 1995 (MMT)	GHG 2000 (MMT)	GHG 2007 (MMT)
NO_x	21.07	19.00	14.25
Oil and gas activities	0.1	0.11	0.31
CO	109.03	92.78	63.88
Oil and gas activities	0.32	0.15	0.32
NMVOCs	19.52	15.23	13.75
Oil and gas activities	0.58	0.39	0.53
SO_2	16.89	1483	11.73
Oil and gas activities	0.34	0.29	0.21

Source: EPA 2009a

3.2.5 Global

Data available for global emissions of GHGs is based less on measurements, in some countries, and more on estimates. In addition, the most comprehensive data is for CO_2 from the "consumption and flaring of fossil fuels," and does not include CH4, N20, or other gases. Table
3.2-13 shows estimated CO_2 emissions for 1995, 2000, 2005, and 2008 by IPCC region, and percent of the total. Table 3.2-14 shows similar information for the ten highest consuming countries and the ten highest per capita consuming countries. The tables were derived from Energy Information Administration data (EIA 2010).

Table 3.2-13 World CO_2 Emissions from the Consumption and Flaring of Fossil Fuels by IPCC Region (MMT CO_2)

IPCC Region	CO_2 1995 (MMT CO_2)	CO_2 2000 (MMT CO_2)	CO_2 2005 (MMT CO_2)	CO_2 2008 (MMT CO_2)	2008 Percent of Total
North America	6,158.5	6,823.1	7,028.8	6,852.3	23
Central & South America	858.2	992.6	1,110.3	1,247.8	4
Europe	4,323.5	4,476.1	4,693.1	4,662.0	15
Eurasia	2,474.3	2,332.8	2,506.3	2,651.9	9
Middle East	901.5	1,094.2	1,448.0	1,678.4	6
Africa	827.0	891.7	1,056.0	1,108.3	4
Asia & Oceania	6,675.5	7,266.2	10,628.6	12,176.6	40
World Total	22,218.5	23,876.6	28,471.0	30,377.3	100

Source: EIA 2010

Table 3.2-14 World CO_2 Emissions from the Consumption and Flaring of Fossil Fuels by Largest Consuming Countries and Largest Per Capita Consuming Countries

IPCC Region	CO_2 1995 (MMT CO_2)	CO_2 2000 (MMT CO_2)	CO_2 2008 (MMT CO_2)	2008 (Metric Tons CO_2 Per Capita)
TEN LARGEST CONSUMING COUNTRIES				
China	2,885.42	2,871.53	6,533.55	4.91
United States	5,325.90	5,863.81	5,832.82	19.18
Russia	1,607.09	1,560.42	1,729.38	12.29
India	876.39	1,009.76	1,494.88	1.31
Japan	1,118.96	1,205.07	1,214.19	9.54
Germany	894.27	857.98	828.76	10.06
Canada	509.94	574.78	573.50	17.27
United Kingdom	561.79	561.66	571.80	9.38

IPCC Region	CO_2 1995 (MMT CO_2)	CO_2 2000 (MMT CO_2)	CO_2 2008 (MMT CO_2)	2008 (Metric Tons CO_2 Per Capita)
Korea, South	382.48	440.29	542.09	11.21
Iran	262.25	320.67	511.12	7.76
TEN LARGEST PER CAPITA CONSUMING COUNTRIES				
Gibraltar	3.24	7.30	4.64	161.57
Virgin Islands, U.S.	8.56	9.85	13.89	126.49
Qatar	30.31	34.70	61.14	74.13
Netherlands Antilles	11.41	11.62	12.29	54.55
Bahrain	15.88	20.26	31.08	43.21
United Arab Emirates	100.94	115.72	199.20	43.10
Trinidad & Tobago	22.63	27.51	50.48	41.00
Singapore	82.97	107.64	159.48	34.61
Kuwait	39.99	59.50	82.10	31.60
Brunei	3.52	3.79	10.40	27.28
World Total	**22,284.01**	**24,010.66**	**30,377.31**	**4.54**

Source: EIA 2010

3.2.6 Summary

Table 3.2-15 summarizes the information in **Sections 3.2.1** through **3.2.5**, showing total CO_2 emissions for the Dixie National Forest Oil and Gas Activities, Utah, the seven-state region in **Section 3.2.3**, the United States, and the World. Data are for CO_2 emissions only and have the same caveats and conditions as described for the tables (above) from which they are derived.

Table 3.2-15 Summary Table

IPCC Region	CO_2 1995 (MMT CO_2)	CO_2 2000 (MMT CO_2)	CO_2 2007 (MMT CO_2)
Dixie NF Oil and Gas Activities	--	--	0.35 (Predicted)
Utah	35.40	63.78	69.23
Region (7-state)	--	--	449.9
United States	5,323.97	5,860.38	5,902.75
World Total	**22,284.01**	**24,010.66**	**30,377.31 (2008)**

4.0 Impacts Analysis

4.1 Connected Actions on Global Warming

The following summarizes Dixie National Forest oil and gas activities emissions, assuming all connected actions to the leasing decision were to occur, as related to U.S. and Global emissions.

4.1.1 Connected Actions GHG Emissions Compared to Existing US and Global emissions

Without taking carbon sinks (Section 3.2.2) into account, CO_2 emissions from predicted oil and gas activities on the Dixie National Forest (i.e., connected actions to leasing) would increase U.S. and world CO_2 emissions. At the national and global scales, this would be a negligible impact. On a state scale, CO_2 emissions from connected actions on the Dixie would constitute a minor increase in CO_2 emissions for Utah in 2007. Because the increases reported here are so small, the difference between CO_{2e} and CO_2 is overlooked. It should also be noted that the GHG emission estimate for connected actions has included emissions from refining, transportation of refined product, and product end use. This is a conservative impact estimate because it could be argued that the emissions from the refinery and later activities are not connected actions to potential Dixie National Forest oil and gas production and may occur regardless of the product source in order to satisfy current and future market conditions.

4.1.2 Effects of Connected Actions on Foreseeable Impacts of Climate Change

Section 2.0, above, describes the potential effects of climate change on Utah, the U.S., and the world, with emphasis on resources. The GHG emission impacts from predicted Dixie National Forest oil and gas activities (connected actions) would incrementally contribute a relatively small amount to the total volume of GHG released to the atmosphere and consequently could be responsible for an increment of the predicted effects of climate change. The incremental impact from connected actions would be negligible to minor and its duration and would likely be long term.

4.2 Effects of Climate Change on the Dixie NF and the Cumulative Effects Area

The potential direct, indirect, and cumulative effects of the connected actions on the environmental resources of the Forest and cumulative effects area are described in the Oil and Gas Leasing EIS. These effects are predicted based on information describing past and existing baseline conditions. These baseline conditions have, to some degree, already been affected by climate change and thus these past and current climate change effects are already included in the impact analysis of the EIS. Future climate change has the potential to further impact many of the same environmental resources in ways that are described in **Section 2.0**. It is difficult to predict with any certainty the cumulative effects of future climate change along with the environmental impacts already described in the EIS.

5.0 Foreseeable Future Responses

The concept of responses to address global warming has evolved since they were first discussed in the First Assessment Report. This report dealt with available cost-effective response measures in terms of "mitigation," mainly in the form of carbon taxes without much concern for equity issues. For the Second Assessment Report, the socio-institutional context was emphasized as well as the issues of equity, development and sustainability. In the Third Assessment Report, the concept of mitigative capacity was introduced, and the focus of attention was shifted to sustainability concerns (Rogner et al. 2007).

The discussion of foreseeable future "responses" to climate change herein will focus on Fourth Assessment Report. The report summarizes the information contained in previous IPCC reports – including the IPCC special reports on Carbon Dioxide Capture and Storage, on Safeguarding the Ozone Layer and on the Global Climate System published since the Third Assessment Report – and assesses the scientific literature published since 2000 (Rogner et al. 2007).

The main anthropogenic source of CO_2 in the atmosphere is the consumption of energy from fossil fuels (IPCC 2001b). Electricity generation and transportation accounted for the vast majority of CO_2 emissions from fossil fuel combustion in 2005 (EPA 2007a). In order to reduce carbon in the atmosphere, meaningful reductions of greenhouse gas emissions will have to be made in these sectors. For this reason, this section will focus on responses to climate change for these two segments of the economy. Brief explanations of responses related to residential and commercial buildings, industry, agriculture, forestry, waste management, and sustainable development will be included as well.

The Third Assessment Report indicates that no single technology option will provide all of the emission reductions needed to achieve stabilization, but a portfolio of responses will be needed (IPCC 2005a).

5.1 Electric Energy Supply

Most scenarios project that the supply of primary electric energy will continue to be dominated by fossil fuels until at least the middle of the century (IPCC 2005a). Within the energy sector, reductions in CO_2 emissions can be accomplished through increased use of nuclear and renewable energy sources, through increased efficiency of existing sources, and through implementation of new technology to existing sources (carbon capture, etc.).

5.1.1 Nuclear Energy

In 2005, 16 percent of the world total electricity supply was generated by nuclear power. Total life-cycle greenhouse gas emissions per unit of electricity are similar to those for renewable energy sources. Proposed and existing fossil fuel power plants could be partly replaced by nuclear power plants to provide electricity and heat. Since the nuclear plant and fuel system consumes only small quantities of fossil fuels in the fuel cycle, net CO_2 emissions could be lowered significantly. The IPCC estimates that 18 percent of total global power generation capacity could come from existing nuclear power plants as well as new plants displacing proposed new coal, gas and oil plants in proportion to their current share of the baseline (Sims et al. 2007). Increased use of nuclear energy at this rate would result in approximately 1.88 Gt CO_2-eq/yr reduction in emissions.

5.1.2 Renewable Energy

Renewable energy accounted for over 15 percent of the world primary energy supply in 2004, including traditional biomass (7 to 8 percent), large hydroelectric (5.3 percent), and other renewables (2.5 percent). Fossil fuels can be partly replaced by renewable energy sources to provide heat or electricity, or through combined heat and power plants. The following discussion is summarized from the IPCC (2005a).

Hydroelectric

Large hydroelectric systems provided 16 percent of global electricity and 90 percent of renewable electricity in 2004. However, where hydro expansion is occurring, major social disruptions, ecological impacts on existing river ecosystems and fisheries and related evaporative water losses are stimulating public opposition. These and other environmental concerns may mean that obtaining resource permits is a constraint in future development. It is assumed that enough existing and new sites will be available to contribute approximately 17 percent of total electricity generation by 2030 as a result of displacing coal, gas and oil plants based on their current share of the base load. Increased use of hydroelectric power would result in 0.87 Gt CO_2-eq/yr reduction in emissions.

Wind

Wind provided approximately 0.5 percent of the total electricity production in 2004. New wind installation capacity has grown at an average of 28 percent per year since 2000, with a record 40 percent increase in 2005. Issues such as noise, electromagnetic force interference, airline flight paths, land use, protection of areas with high landscape value, and bird and bat strike remain constraints. On- and offshore wind power is assumed to reach a 7 percent share by 2030, and to displace new and existing fossil fuel power plants according to the relevant shares of coal, oil and gas in the baseline for each region. Increased use of wind power is project to result in 0.93 Gt CO_2-eq/yr reduction in emissions.

Bioenergy

Biomass continues to be the world"s major source of food, stock fodder and fiber as well as a renewable resource of hydrocarbons for use as a source of heat, electricity, liquid fuels and chemicals. Bioenergy carriers range from a simple firewood log to a highly refined gaseous fuel or liquid biofuel. Globally, biomass is estimated to be over 10 percent of global primary energy, but with over two thirds consumed in developing countries as traditional biomass for household use. Biomass can be combined with fossil fuel technologies by co-firing solid biomass particles with coal; mixing synthesis gas, landfill gas or biogas with natural gas prior to combustion. There has been rapid progress since the Third Assessment Report in the development of the co-utilization of biomass materials in coal-fired boiler plants.

Large global resources of biomass could exist by 2030, but confidence in estimating the bioenergy heat and power potential is low since there will be competition for these feedstocks for biomaterials, chemicals and biofuels. The potential contribution to the electricity mix from biomass by 2030 is 7 percent, resulting in net emissions reductions of 1.22 Gt CO_2-eq/yr (for energy production only; not including transportation).

Geothermal

Geothermal resources have long been used for direct heat extraction for building and district heating, industrial processing, domestic water and space heating, and leisure applications. In 2004 installed geothermal generation capacity produced 0.3 percent of global electricity in 2004. Production is growing at around 20 percent per year, with an estimated total of 2 percent of generation by 2030. Increased use of geothermal resources is estimated to result in reduced emissions of 0.43 Gt CO_2-eq/yr.

Solar

Solar energy contributes to the total energy scenario through concentrating solar power (CSP) plants, solar photovoltaics (PV), and through solar heating and cooling. Solar PV and CSP plants accounted for less than 0.2 percent of the 2005 share of total supply of global energy sources. These sources could potentially account for 2 percent of the global electricity mix by 2030, resulting in emissions reductions of 0.25 Gt CO_2-eq/yr.

Ocean Energy

The potential marine-energy resource of wind-driven waves, gravitational tidal ranges, thermal gradients between warm surface water and colder water, salinity gradients, and marine currents is huge, but the amount that is currently exploitable economically is low. All the related technologies are at an early stage of development. The marine-energy industry is now in a similar stage of development to the wind industry in the 1980s. Ocean energy is immature and assumed unlikely to make a significant contribution to overall power needs by 2030.

5.1.3 Increased Efficiency

Reductions in CO_2 emissions can be gained by improving the efficiency of existing power generation plants by employing more advanced technologies using the same amount of fuel. For example, a 27 percent reduction in emissions is possible by replacing a 35 percent efficient coal-fired steam turbine with a 48 percent efficient plant using advanced steam, pulverized-coal technology. Replacing a natural gas single-cycle turbine with a combined cycle of similar output capacity helps reduce CO_2 emissions per unit of output by around 36 percent.

5.1.4 Carbon Dioxide Capture and Storage (CCS)

CO_2 capture and storage (CCS) is a process consisting of the separation of CO_2 from industrial and energy-related sources, transport to a storage location and long-term isolation from the atmosphere (IPCC 2005a).

Capture of CO_2 can best be applied to large carbon point sources including coal-, gas- or biomass-fired electric power-generation or cogeneration facilities, major energy-using industries, synthetic fuel plants, natural gas fields and chemical facilities for producing hydrogen, ammonia, cement and coke. Potential storage methods include injection into underground geological formations, in the deep ocean or industrial fixation as inorganic carbonates. Application of CCS for biomass sources could result in the net removal of CO_2 from the atmosphere. Storage capacity in oil and gas fields, saline formations and coal beds is considered to be large but currently uncertain. Clarification of the nature and scope of long-term environmental consequences of ocean storage requires further research. Concerns around geological storage include rapid release of CO_2 as a consequence of seismic activity and the impact of old and poorly sealed well bores. Overall capacity estimates for CCS are still under debate. In absence of explicit government policies requiring CCS, it is unlikely to be deployed on a large scale by 2030 (Sims et al. 2007). CCS in underground geological formations is a new technology with potential to make an important contribution to mitigation by 2030. Technical, economic and regulatory developments will affect the actual contribution (IPCC 2007d).

Despite anticipated reductions in emissions from expanded use of nuclear and renewable energy sources, increased efficiency, and increased use of sustainable design, the world is not on course to achieve a sustainable energy future. The global energy supply will continue to be dominated by fossil fuels for several decades to come. To reduce the resultant GHG emissions will require a transition to zero- and low-carbon technologies, which will require policy intervention on an international scale (Sims et al. 2007).

5.2 Transportation

In 2004, transport was responsible for 23 percent of world energy-related GHG emissions with about three quarters coming from road vehicles. In 2004, the transport sector produced 6.3 Gt of

CO_2 emissions. Over the past decade, transport"s GHG emissions have increased at a faster rate than any other energy using sector. Transport activity, a key component of economic development and human welfare, is increasing around the world as economies grow. Transport activity is expected to grow robustly over the next several decades. Unless there is a major shift away from current patterns of energy use, world transport energy use is projected to increase at the rate of about 2 percent per year, and the total transport energy use and carbon emissions is projected to be about 80 percent higher than current levels by 2030 (Kahn et al. 2007).

5.2.1 Road Transport

GHG emissions associated with vehicles can be reduced by four types of measures:

1. Reducing the loads (weight, rolling and air resistance and accessory loads on the vehicle, thus reducing the work needed to operate it).
2. Increasing the efficiency of converting the fuel energy to work by improving drive train efficiency and recapturing energy losses;
3. Changing to a less carbon-intensive fuel; and
4. Reducing emissions of non-CO_2 greenhouse gases from vehicle exhaust and climate controls.

Carbon emissions from „new" light-duty road vehicles could be reduced by up to 50 percent by 2030 assuming continued technological advances and strong government policies to ensure that technologies are applied to increasing fuel economy rather than on increased horsepower and vehicle mass. Material substitution and advanced design could reduce the weight of light-duty vehicles by 20 to 30 percent. The use of hybrid technology with heavy intercity trucks could reduce fuel use by 10 to 20 percent. Road vehicle efficiency might be improved by 5 to 20 percent through strategies such as eco-driving styles, increased load factors, improved maintenance, in-vehicle technological aids, more efficient replacement tires, reduced idling and better traffic management and route choice. Total mitigation potential in 2030 of the energy efficiency options applied to light duty vehicles would be around 0.7 – 0.8 Gt CO_2-eq (Kahn et al. 2007).

5.2.2 Rail Transport

Although rail transport is one of the most energy efficient modes today, substantial opportunities for further efficiency improvements remain. Reduced aerodynamic drag, lower train weight, regenerative breaking and higher efficiency propulsion systems can make significant reductions in rail energy use. Shipping, also one of the least energy intensive modes of transport, still has some potential for increased energy efficiency. Studies assessing both technical and operational approaches have concluded that energy efficiency opportunities of a few percent up to 40 percent are possible (Kahn et al. 2007).

5.2.3 Aircraft

Passenger jet aircraft produced today are 70 percent more fuel efficient than the equivalent aircraft produced 40 years ago and continued improvement is expected. A 20 percent improvement over 1997 aircraft efficiency is likely by 2015 and possibly a 40 to 50 percent improvement is anticipated by 2050. Still greater efficiency gains will depend on the potential of novel designs such as blended wing body, or propulsion systems such as the unducted turbofan. For 2030 the estimated mitigation potential is 150 Mt CO_2. However, without policy intervention, projected annual improvements in aircraft fuel efficiency of the order of 1 to 2 percent will be surpassed by annual traffic growth of around 5 percent each year, leading to an annual increase of CO_2 emissions of 3 to 4 percent per year (Kahn et al. 2007).

5.2.4 Biofuels

Biofuels have the potential to replace a substantial part but not all petroleum use by transport. A recent analysis estimates that biofuels" share of transport fuel could increase to about 10 percent in 2030. The global potential for biofuels will depend on the success of technologies to utilize cellulose biomass (Kahn et al. 2007).

5.2.5 Public Transportation

Providing public transports systems and their related infrastructure and promotion non-motorized transport can contribute to greenhouse gas responses. However, local conditions determine how much transport can be shifted to less energy intensive modes. Occupancy rates and primary energy sources of the transport mode further determine the response impact. The energy requirements for urban transport are strongly influenced by the density and spatial structure of the built environment, as well as by location, extent and nature of transport infrastructure.

While transport demand certainly responds to price signals, the demand for vehicles, vehicle travel and fuel use are significantly price inelastic. As a result, large increases in prices or taxes are required to make major changes in greenhouse gas emissions. Since currently available response options will probably not be enough to prevent growth in transport"s emissions, technology research and development is essential in order to create the potential for future, significant reductions in transport greenhouse gas emissions (Kahn et al. 2007).

5.3 Residential and Commercial Buildings

There is a broad array of accessible and cost-effective technologies and know-how which can abate GHG emissions in buildings to a significant extent. These include passive solar design, high-efficiency lighting and appliances, highly efficient ventilation and cooling systems, solar water heaters, insulation materials and techniques, high-reflectivity building materials and multiple glazing. The largest savings in energy use (75 percent or higher) occur for new buildings, through designing and operating buildings as complete systems. Realizing these savings requires an integrated design process involving architects, engineers, contractors and clients, with full consideration of opportunities for passively reducing building energy demands. Over the whole building stock the largest portion of potential carbon savings by 2030 is in retrofitting existing buildings and replacing energy-using equipment due to the slow turnover of the stock (Levine et al. 2007).

5.4 Industry

Many options exist for responding to GHG emissions from the industrial sector. These options can be divided into three categories:

- Sector-wide options, for example more efficient electric motors and motor-driven systems; high efficiency boilers and process heaters; fuel switching, including the use of waste materials; and recycling.
- Process-specific options, for example the use of the bioenergy contained in food and pulp and paper industry wastes turbines to recover the energy contained in pressurized blast furnace gas, and control strategies to minimize PFC emissions from aluminum manufacture.
- Operating procedures, for example control of steam and compressed air leaks, reduction of air leaks into furnaces, optimum use of insulation, and optimization of equipment size to ensure high capacity utilization.

Full use of available response options is not being made in either industrialized or developing nations. In many areas of the world, GHG responses are not demanded by either the market or government regulations. Industrial GHG investment decisions will continue to be driven by consumer preferences, costs, competitiveness and government regulation. Achieving sustainable development will require the implementation of cleaner production processes without compromising employment potential (Bernstein et al. 2007).

Industry is vulnerable to the impacts of climate change, particularly to the impacts of extreme weather. Companies can adapt to these potential impacts by designing facilities that are resistant to projected changes in weather and climate, relocating plants to less vulnerable locations, and diversifying raw material sources, especially agricultural or forestry inputs. Industry is also vulnerable to the impacts of changes in consumer preference and government regulation in response to the threat of climate change. Companies can respond to these by mitigating their own emissions and developing lower-emission products (Bernstein et al. 2007).

5.5 Agriculture

A variety of options exists as possible responses to GHG emissions in agriculture. The most prominent options are improved crop and grazing land management (e.g., improved agronomic practices, nutrient use, tillage, and residue management), restoration of organic soils that are drained for crop production and restoration of degraded lands. Lower but still significant responses are possible with improved water and rice management; set-asides, land use change (e.g., conversion of cropland to grassland) and agro-forestry; as well as improved livestock and manure management. Many opportunities use current technologies and can be implemented immediately, but technological development will be a key driver ensuring the efficacy of additional measures in the future. Soil carbon sequestration (enhanced sinks) is the mechanism responsible for most of the response potential, with an estimated 89 percent contribution to the technical potential (Smith et al. 2007).

Greenhouse gas emissions could also be reduced by substituting fossil fuels with energy produced from agricultural feed stocks (e.g., crop residues, dung, energy crops), which would be counted in sectors using the energy. Deployment of new practices for livestock systems and fertilizer applications will be essential to prevent an increase in emissions from agriculture after 2030 (Smith et al. 2007).

5.6 Forestry

The carbon response potentials from reducing deforestation, forest management, afforestation (establishment of a new forest by seeding or planting on nonforested land), and agro-forestry differ greatly by activity, regions, system boundaries and the time horizon over which the options are compared. In the short term, the carbon response benefits of reducing deforestation are greater than the benefits of afforestation. That is because deforestation is the single most important source, with a net loss of forest area between 2000 and 2005 of 7.3 million ha/yr (Naburrs et al. 2007).

Response options by the forestry sector include extending carbon retention in harvested wood products, product substitution, and producing biomass for bioenergy. This carbon is removed from the atmosphere and is available to meet society"s needs for timber, fiber, and energy. In the long term, a sustainable forest management strategy aimed at maintaining or increasing forest carbon stocks, while producing an annual sustained yield of timber, fiber or energy from the forest, will generate the largest sustained benefit. The combined effects of reduced deforestation and degradation, afforestation, forest management, agro-forestry and bioenergy have the potential to increase from the present to 2030 and beyond (Naburrs et al. 2007).

5.7 Waste Management

Existing waste-management practices can provide effective responses to GHG emissions from this sector: a wide range of mature, environmentally effective technologies are available to provide public health, environmental protection, and sustainable development co-benefits. Collectively, these technologies can directly reduce GHG emissions (through landfill gas recovery, improved landfill practices, engineered wastewater management) or avoid significant greenhouse gas generation (through controlled composting of organic waste, state-of-the-art incineration and expanded sanitation coverage). In addition, waste minimization, recycling and re-use represent an important and increasing potential for indirect reduction of GHG emissions through the conservation of raw materials, improved energy and resource efficiency and fossil fuel avoidance (Bogner et al. 2007).

5.8 Sustainable Development

The concept of sustainable development is defined as, "development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

There is growing emphasis in the literature on the two-way relationship between responses to climate change and sustainable development. The relationship may not always be mutually beneficial. In most instances, responses can have ancillary benefits or co-benefits that contribute to other sustainable development goals (climate first). Development that is sustainable in many other respects can create conditions in which responses can be effectively pursued (development first). Climate policy alone will not solve the climate problem. Making development more sustainable by changing development paths can make a major contribution to climate goals (Sathaye et al. 2007).

5.9 Natural Biological Sinks

Natural sinks for CO_2 already play a significant role in determining the concentration of CO_2 in the atmosphere. They may be enhanced to take up carbon from the atmosphere. Examples of natural sinks that might be used for this purpose include forests and soils. Enhancing these sinks through agricultural and forestry practices could significantly improve their storage capacity but this may be limited by land use practice, and social or environmental factors. Carbon stored biologically already includes large quantities of emitted CO_2 but storage may not be permanent (IPCC 2005b).

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Appendix SIR-2A

Dixie National Forest Greenhouse Gas Emission Annual Estimates

November 11, 2009

Memorandum

TO: Brian Buck

FROM: Dan Heiser, Dave Strohm, and Melissa Armer

RE: Dixie National Forest Greenhouse Gas Emission Annual Estimates

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Overview

The purpose of this memo is to address greenhouse gas (GHG) emissions as part of the Dixie National Forest's (Dixie) Oil and Gas Environmental Impact Statement (EIS). The activities which are anticipated to contribute to GHG emissions are listed below:

- Exploration drilling
- Production operations- drilling and pumping
- Transportation of crude oil from field to refinery
- Refining of crude oil into final product
- Transportation of final product to end user
- End use of product

This memo provides emissions estimates for each activity listed above and includes assumptions, methods, sources of information, and calculations used to develop the emissions. Detailed emission calculations are included in the Attachment. Emissions are reported in metric tons of Carbon Dioxide Equivalent (CO_{2e}) which is the standard unit of measure established by the Environmental Protection Agency (EPA) for GHG emissions. Carbon dioxide equivalency allows all GHGs to be compared on a common basis. Non-CO_2 gases are converted to CO_{2e} by multiplying by the Global Warming Potential (GWP) for each gas.

Exploration Drilling

Exploratory drilling is predicted to occur at unspecified locations in the Forest as part of the Reasonably Foreseeable Development Scenario (RFDS). GHG emissions estimates were developed utilizing the impacts of a single diesel fueled drill rig operation that will be able to drill and complete three exploratory wells per year. Each well was assumed to take approximately 90 days to drill and assumed 24 hour per day operation. Emissions were calculated utilizing emission factors from the Mandatory Greenhouse Gas Reporting final rule, 40 CFR Chapter I Subchapter C Part 98 Subpart C Table C-1. The factors utilized were for "Distillate Fuel Oil #2" which is consistent with the diesel fuel used during drilling.

In addition to direct drill rig emissions, a conservative assumption was made that natural gas encountered during drilling would be flared at the drill site. GHG flare emissions were calculated assuming a flare combustion efficiency of 98%, which is consistent with the combustion efficiency listed in the mandatory GHG reporting rule. The flare combustion emissions were then calculated using emission factors from 40 CFR Chapter I Subchapter C Part 98 Subpart C Table C-1 for "Natural Gas." The 2% of non-combusted natural gas was estimated to be composed of

90% methane[1] and the emissions from this non-combusted portion were also reported. The total amount of natural gas used to calculate the exploration flare emissions was assumed to be 100 mmscf/yr. This value is consistent with the volume of natural gas used to calculate the criteria pollutant emissions for the project.

The combination of these emission sources were calculated and reported as total exploratory drilling emissions. The result was estimated at 9,993 metric tons of CO_2e/yr. This total represents the emissions that would occur during any single year of drilling during the exploration phase.

Production Operations - Drilling and Pumping

Once exploratory drilling leads to developable liquid mineral resources, the RFDS will move into extraction/production. The production field will be developed over many years utilizing the same drilling process (and resultant GHG emissions) as that expressed during the exploratory drilling phase. Once a complete well field is developed, full production will commence. This GHG analysis sought to predict maximum potential GHG emissions and therefore assumed that a full 20 well production field was already in place for the production emissions scenario (a theoretical 20 well production field is used in other analyses for the EIS). The theoretical production field was comprised of 20 active oil well pumps fueled by diesel fuel. Emissions for natural gas and electric fueled well pumps were also developed, but diesel was utilized during this analysis as it produced the highest GHG emissions per barrel of oil developed. In addition to the oil well pumps, the theoretical field included equipment for the recovery, treatment and flaring of reasonably foreseeable amounts of natural gas.

For conservatism, the field was assumed to contain 20 heater/treater apparatus (one for each well location), a central natural gas fired compressor, two natural gas dehydrators and a single production flare. Finally, the field also included ongoing drilling operations for either exploration or additional production well development. The emissions for these pieces of equipment were included in a fashion analogous to that described in the exploration drilling section and directly mirrors the scenario used during the modeling and emissions development of criteria pollutants for the project. The emission factors inherent to the combustion calculations were sourced from 40 CFR Chapter I Subchapter C Part 98 Subpart C Table C-1.

In addition to combustion GHG emissions during the production phase, fugitive methane emissions from production equipment were also estimated. Typical sources of fugitive methane emissions in oil systems include the following:[2]

- Leaks from system components- connections, valves, flanges and instruments
- Process vents- glycol dehydrators and storage tanks
- Emissions from starting and stopping reciprocating engines
- Emissions during drilling activities, *e.g.*, gas migration from reservoirs through wells.

Detailed emission calculations associated with each piece of well field equipment as well as fugitive methane emissions are included in Attachment A. The combination of all production well field emissions were calculated and reported as total production emissions. The result was estimated at 43,443 metric tons of CO_2e/yr.

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[1] NaturalGas.org- Overview and Background of natural gas- Typical composition is 70-90% methane
[2] Methods for Estimating Methane Emissions from Natural Gas and Oil Systems, 1999 Vol 8. Ch.3.

Transportation from Field to Refinery

After the crude oil is extracted, it will be transported via tanker truck to a refinery. It is assumed a likely destination for the crude oil would be a refinery in the Salt Lake City, Utah area. There are five oil refineries located in the north Salt Lake City (SLC) area with a combined refining capacity of 167,700 barrels per day (bpd) crude oil. The RFDS for the DNF EIS analysis is that the oil field would produce about 2,000 bpd of crude oil. It is assumed this amount of crude oil could be refined at one of the SLC refineries. Assuming 365 day/yr production the project would yield an estimated 730,000 bbl annually.

In order to determine the greenhouse gas emissions associated with trucking of the produced crude, a distance needed to be calculated from the extraction point to the refinery. Since no well locations have been selected at this time, numerous extraction points located throughout the DNF were selected. The distance from these points to the nearest SLC refinery were calculated and the numerical average of these distances was used for the transport emission calculations. The average distance from the extraction points to the refinery was calculated to be 300 miles. Assuming a lead tank truck and pull trailer configuration with an average capacity of 293 bbl (12,300 gallons) this results in a total of 2,491 trips per year.[3]

The primary GHG emissions resulting from transport of crude oil to the refinery is CO_2. Transportation emission factors were taken from the World Resources Institute GHG Protocol[4] tool for mobile combustion. This tool utilizes default emission factors from the EPA based on vehicle class, fuel combusted, and distance traveled. The same emission factors were also used to calculate the emissions caused by the return of empty tanker trucks from the refinery back to the oil field. In addition to the GHG emissions caused by mobile combustion during transport, fugitive methane emissions from loading and unloading tanker trucks as well as tanker truck vents were estimated.

The total emissions resulting from roundtrip crude oil transport from the Forest to the refinery as well as fugitive releases are estimated to be 2,161 metric tons CO_2e/yr.

Refining into Final Product

Emission estimates were also completed for the emissions which would result from refining the crude into final products. Emissions were estimated based on a crude oil life cycle case study published in the Oil and Gas Journal.[5] An average emission factor from five crude oil life cycle case studies was used to estimate refining emissions. The refinery modeling used in the life cycle analyses was based on a selected truncated version of T.J. McCann & Associates Ltd."s refinery capital planning model programs. The emissions from refining are estimated to be 21,019 metric tons CO_2e/yr.

Transportation of Final Product to End User

After the crude oil is refined into a final product it is assumed to be transported via tanker truck to terminals for final distribution and end use.

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[3] Per phone conversation on 10/27/09 with Beall, trailers and parts representative Brett Durfee located in SLC, Utah.
[4] World Resources Institute (2008). GHG Protocol tool for mobile combustion. Version 2.0
[5] McCann, Tom, Magee, Phil (1999). Crude Oil Greenhouse Gas Life Cycle Analysis Helps Assign Values For CO 2

Emissions. *Oil and Gas Journal, 97* (8).

In 2008 Utah"s petroleum product consumption was in excess of in-state production so it is assumed that all refinery products will be consumed within Utah.[6] The average one-way distance from the representative SLC refinery to the end user is assumed to be 150 miles. It was assumed that the total crude refined produces 682,550 bbl/yr of the following products: gasoline, distillate fuel, jet fuel, residual fuel oil, LPG and still gas. All of the products are assumed to be transported to market in tanker trucks except the small amount of still gas which is assumed to be consumed at the refinery.

Assuming a lead tank truck with pull trailer configuration with an average capacity of 319 bbl (13,400 gallons) equates to a total of 2,066 trips per year. Emission calculations were completed as described above for Transportation from the Field to the Refinery. Emission calculations were completed based on the total round-trip distance for transport from the refinery to the end user. The emissions resulting from roundtrip product transport from the refinery to the end user are estimated to be 868 metric tons CO_2e/yr.

End Use

Emission estimates were also completed for the emissions that are caused by the complete combustion or oxidation of each petroleum product produced at the refinery from the subject crude oil during the calendar year. According to the Mandatory Greenhouse Gas Reporting Rule[7] suppliers of petroleum products are required to report the CO_2 emissions associated with the final use of the products. Since N_2O and CH_4 emissions comprise a relatively small proportion of overall combustion or oxidation emissions of the subject products, only CO_2 emissions estimates are included for this analysis.

The following product mix was assumed, based on 2008 Utah overall refinery production data.[4]

- 49.2% motor gasoline
- 24.9% distillate fuel
- 7.8% jet fuel
- 5.1% residual fuel oil
- 3.3% LPG
- 3.2% still gas
- 6.5% other, mostly unfinished oil and coke (not burned)

The end use emission calculations utilized 40 CFR Part 86 equation MM-1 and emission factors from Table MM-1. Below is a list of assumptions made in selecting the emission factors for end use emission calculations.

- Emission factors for motor gasoline assume the average of various products blend formulations
- Jet fuel emission factor assumed to be "Kerosene-Type Jet Fuel"
- Residual Fuel Oil: Emission factor assumes average of "Residual Fuel Oil No. 5 and Residual Fuel Oil No.6"
- LPG emission factor assumes 60% propane; 40% butane mix

The emissions resulting from the complete combustion or oxidation of each petroleum product produced during the calendar year are estimated to be 268,312 metric tons CO_2e/yr.

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[6] Utah Geological Survey: Utah Energy and Mineral Statistics http://geology.utah.gov/emp/energydata/index.htm
[7] "EPA Final Mandatory Greenhouse Gas Reporting Rule." 40 CFR Part 86 Subpart MM Suppliers of Petroleum Products (September 22, 2009).

Conclusion

The overall estimated GHG emissions as part of the Dixie Oil and Gas EIS from the activities outlined in this memo are 345,796 metric tons CO_2e/yr.

Attachment
Detailed Emission Calculations

Summary of Greenhouse Gas Emission for Proposed EIS Activities

Process	GHG Emissions CO_2 (metric tons)	Total GHG Emissions, CO_2 (metric tons CO_2e)
Exploration[1]	9,993	9,993
Production[2]	43,443	43,443
Transportation of Crude	2,161	2,161
Refining	21,019	21,019
Transportation of Refined Products	868	868
Product End Use	268,312	268,312
Total		**345,796 metric tons**

Assumptions:

[1] Assumes highest emissions associated with a single exploratory well and associated exploratory flare.

[2] Assumes 20 production wells with natural gas burning engines as well as natural gas recovery equipment and a diesel fueled exploratory drill rig engine.

EXPLORATION AND PRODUCTION SUMMARY

Source Name	Number of Units Exploration Drill Scenario	Number of Units 20 Well Scenario [1]	Size	Unit	CO_{2e} (Metric Tons/Year)	Notes/Status
EXPLORATION						
Drill Rig Engine	1	1	800.00	Hp	2,683.86	Diesel engine operating 90 days/well & 24 hr/day.
Mud Degassing						No significant greenhouse gas emissions.
Exploration Flares	1	1	100	mmscf/yr	7,309.23	Operating hours same as drill rig.
PRODUCTION						
Heater Treater		20	0.50	mmbtu/hr	4,644.55	Assume 20 Treaters @ 0.5 (No Suggestions)/hr one for each wells.
Dehydrator		2	0.50	mmbtu/hr	464.46	Assume 2 Dehydrators @ 0.5 MMBtu/hr one for each 10 wells. NG combustion, for low volume gas production
Production Flare		1	300.0	mmscf/yr	18,273.07	One production flare per well field.
Compressor Engine		1	300	Hp	747.58	Assumed (1) NG compressors @ 500 Hp each operating for 3,000 hrs/yr. Used to transport oil through lines.
Well Pumps (NG)		20	100	Hp	8,731.76	With 20 NG pumps 1 for each well @ 100 Hp each. Operating continuously.
Well Pumps (diesel)		20	100	Hp	9,070.45	With 20 diesel pumps 1 for each well @ 100 Hp each. Operating continuously.
Well pumps(electric)		20	100	Hp	0.00	With 20 electric pumps 1 for each well @ 100 Hp each. Operating continuously.
Production Fugitives					250.01	

EXPLORATION AND PRODUCTION SUMMARY CONT.

Exploration

Single Exploratory Well Being Drilled with Exploratory Flare				9,993.09	Highest Exploratory Scenario Reported For GHG Summary
Production with On-Going Exploration					
while drilling one well, NG well pumps				43,104.51	
while drilling one well, diesel well pumps				43,443.20	Highest Production Scenario Reported For GHG Summary
while drilling one well, electric well pumps				34,372.75	
without any drilling, diesel well pumps				33,450.12	
without any drilling, NG well pumps				33,111.42	
without any drilling, electric well pumps				24,379.66	

[1] A 20 well oil field is proposed for the reasonably foreseeable development scenario for the production of oil on the forest.

ENGINE EMISSION CALCULATIONS

Calculation Formula for Drill Rig Engine Emissions

Emission factor (kg/mmbtu) * Fuel Heating Value (mmbtu/gal) * (gal/yr) * 0.001 = Emission Rate (metric tons/yr)

Source Name	# Wells per Year	HP Rating	Op Hours[1]	Fuel
Drill Rig Engine	3	800	6,480	Diesel Fuel
Brake-Specific Fuel Consumption:		**Fuel Heat Value**		**Annual Fuel Usage**
7,000 Btu/hp-hr[3]		138,000 Btu/gal		262,957 gallons
Constituent	**Emission Factor (kg/mmbtu)**			**Potential Emission Rate (Metric tons/yr)**
CO_2[2]	7.40E+01			2,684

[1]Based on each well taking 90 days to drill and 24 hrs of operation per day

[2] CO_2 emission factor from 40 CFR Chapter I Subchapter C Part 98 Subpart C Table C-1 for "Distillate Fuel Oil #2"
CO_2 emissions assume a fuel heat value of 0.138mmbtu/gal. Since N2O and CH4 emissions comprise a relatively small proportion of overall combustion emissions, only CO2 emissions estimates are included

[3]Brake-Specific Fuel Consumption AP-42 Table 3.3-1

Calculation Formula for Diesel Well Pump Emissions

Emission factor (kg/mmbtu) * Fuel Heating Value (mmbtu/gal) * (gal/yr) * 0.001 = Emission Rate (metric tons/yr)

Source Name	# Wells per Year	HP Rating	Op Hours[1]	Fuel
Well Pumps	1	100	8,760	Diesel
Brake-Specific Fuel Consumption:		**Fuel Heat Value**		**Annual Fuel Usage**
7,000 Btu/hp-hr[3]		138,000 Btu/gal		44,435 gallons
Constituent	**Emission Factor (kg/mmbtu)**			**Potential Emission Rate (Metric tons/yr)**
CO_2[2]	7.40E+01			454

[1] Based on each well taking 90 days to drill and 24 hrs of operation per day

[2] CO_2 emission factor from 40 CFR Chapter I Subchapter C Part 98 Subpart C Table C-1 for "Distillate Fuel Oil #2"
CO_2 emissions assume a fuel heat value of 0.138mmbtu/gal. Since N2O and CH4 emissions comprise a relatively small proportion of overall combustion emissions, only CO2 emissions estimates are included

[3]Brake-Specific Fuel Consumption AP-42 Table 3.3-1

Calculation Formula for Natural Gas Well Pump Emissions

Emission factor (kg/mmbtu) * Fuel Heating Value (mmbtu/scf) * (mmscf/yr) * 10^6 * 0.001 = Emission Rate (metric tons/yr)

Source Name	# Wells per Year	HP Rating	Op Hours	Fuel
Well Pumps	1	100	8,760	Natural Gas
Brake-Specific Fuel Consumption:		**Fuel Heat Value**		**Annual Fuel Usage**
9,400 Btu/hp-hr [2]		1,028 Btu/scf		8.01 mmscf
Constituent	**Emission Factor (kg/mmbtu)**			**Potential Emission Rate (Metric tons/yr)**
CO_2[1]	5.30E+01			437

[1] CO_2 emission factor from 40 CFR Chapter I Subchapter C Part 98 Subpart C Table C-1 for "Natural Gas"
CO_2 emissions assume a fuel heat value of 1.028×10^{-3} mmbtu/scf from 40 CFR Chapter I Subchapter C Part 98 Subpart C Table C-1 for "Natural Gas"
Since N_2O and CH_4 emissions comprise a relatively small proportion of overall combustion emissions, only CO_2 emissions estimates are included

[2] Brake-Specific Fuel Consumption was based on default BSFC value for natural gas from the June 2003 edition of the American Oil and Gas Reporter article "Artificial Lift Technology" by Kavas Mistry

COMPRESSOR EMISSION CALCULATIONS

Calculation Formula
Emission factor (kg/mmbtu) * Fuel Heating Value (mmbtu/scf) * (mmscf/yr) * 10^6 * 0.001 = Emission Rate (metric tons/yr)

Source Name	# Compressors	HP Rating	Op Hours	Fuel
Compressors	1	500	3,000	Natural Gas
Brake-Specific Fuel Consumption:		Fuel Heat Value		Annual Fuel Usage
9,400 Btu/hp-hr[2]		1,028 Btu/scf		13.72 mmscf
Constituent	Emission Factor (kg/mmbtu)	Emission Factor (lb/hp-hr)	Emission Rate (lb/hr)	Potential Emission Rate (Metric tons/yr)
CO_2[1]	5.30E+01		498.39	748

[1] CO_2 emission factor from 40 CFR Chapter I Subchapter C Part 98 Subpart C Table C-1 for "Natural Gas"
CO_2 emissions assume a fuel heat value of 1.028×10^{-3} mmbtu/scf from 40 CFR Chapter I Subchapter C Part 98 Subpart C Table C-1 for "Natural Gas"
Since N_2O and CH_4 emissions comprise a relatively small proportion of overall combustion emissions, only CO_2 emissions estimates are included

[2] Brake-Specif ic Fuel Consumption w as based on default BSFC value for natural gas from the June 2003 edition of the American Oil and Gas Reporter article "Artif icial Lift Technology" by Kavas Mistry

HEATER EMISSIONS

Average Saturated Gas Heating Value (btu/scf) = 1,028

Calculation Formula
Emission factor (kg/mmbtu) * Fuel Heating Value (mmbtu/scf) * (mmscf/yr) * 10^6 * 0.001 = Emission Rate (metric tons/yr)

Emissions per unit

Source Name	Annual Hours of Operation	Heat Input (mmbtu/hr)	Annual Fuel Usage (mmscf)	CO_2[1] Emission Factor 53.02 (kg/mmbtu) Metric Tons/yr
Heater Treater	8,760	0.50	4.26	232.23
Dehydrator/ Reboiler	8,760	0.50	4.26	232.23
		Totals	**8.52**	**464.46**

[1] CO_2 emission factor from 40 CFR Chapter I Subchapter C Part 98 Subpart C Table C-1 for "Natural Gas"
CO_2 emissions assume a fuel heat value of 1.028×10^{-3} mmbtu/scf from 40 CFR Chapter I Subchapter C Part 98 Subpart C Table C-1 for "Natural Gas"
Since N_2O and CH_4 emissions comprise a relatively small proportion of overall combustion emissions, only CO_2 emissions estimates are included

FLARE EMISSIONS

Calculation Formula

Emission factor (kg/mmbtu) * Fuel Heating Value (mmbtu/scf) * Flared Volume (mmscf/yr) * 10^6 * 0.001 = Emission Rate (metric tons/yr)

Methane Fugitives

Total methane released (MMscf/yr) *Density CH4 (0.7 kg/m3) ÷ 35.3 ft3/m3 * 10^6 * 0.001 = metric tons methane/yr

Source Name	Annual Hours of Operation	Heating Value (Btu/scf)	Annual MMscf	Volume Flared (mmscf/yr)[1]	Fugitive Releases (mmscf/yr)	Average Heat Input (mmbtu/hr)	CO_2[3] Emission Factor	CH_4[2] Fugitives	Total CO_2 Equivalent[4]
							53.02		
							kg/mmbtu		
							Metric tons/yr	Metric tons/yr	Metric tons/yr
Exploration Flare	6,480	1050.0	100	98.00	2.00	16.20	5,341	35.69	6,091
Exploration Blooie Line	6,480	1050.0	20	19.60	0.40	3.24	1,068	7.14	1,218
Production Flare	8,760	1050.00	300	294.00	6.00	35.96	16,024	107.08	18,273
Totals			**420**				**22,434**	**149.92**	**25,582**

[1] Assume a flare combustion efficiency of 98%. 98% of natural gas is combusted and 2% is released as fugitives.

[2] Assume methane is 90% of the natural gas fugitives released. Assume a CH_4 density of 0.7 kg/m3

[3] CO_2 emission factor from 40 CFR Chapter I Subchapter C Part 98 Subpart C Table C-1 for "Natural Gas"

CO_2 emissions assume a fuel heat value of 1.028×10^{-3} mmbtu/scf from 40 CFR Chapter I Subchapter C Part 98 Subpart C Table C-1 for "Natural Gas"

Since N_2O and CH_4 emissions comprise a relatively small proportion of overall combustion emissions, only CO_2 emissions estimates are included

[4] Assume GWP of CH4 = 21

FUGITIVE METHANE EMISSIONS

Methane Fugitives
Annual Production (bbl/yr) * Heating Value (mmbtu/bbl) * Emission Factor (lb CH_4/mmbtu) ÷ 2.2 lb/kg * 0.001 = metric tons methane/yr

Source Name	Annual Production (bbl)	Heating Value (mmbtu/bbl)[2]	CH_4[1] Fugitive Emission Factor (lb CH_4/mmbtu)	Total CH_4 Emissions (metric tons/yr)	Total CO_2 Equivalent[3] (metric tons/yr)
Oil Production Operation	730,000	5.8	0.0062	12	250
Crude Oil Transportation	730,000	5.8	0.0017	3	69
			Totals	**15**	**319**

[1] Methods for Estimating Methane Emissions From Natural Gas and Oil Systems, 1999 Vol 8. Ch.3. Assumes median emission factor from Table 3.4-4 from oil production
[2] Energy Information Administration (EIA), (1997), Annual Energy Review : 1996, US Department of Energy, Washington, DC, July 1997, p. 354.
[3] Assume GWP of CH_4 = 21

Transportation Emission Calculations

Source Description	Mode of Transport	Type of Activity Data	Activity Data				GHG Emission Factors	GHG Emissions
			Vehicle Type	Distance Traveled	Unit of Distance	Fuel Used	CO_2 (gm CO_2/km)	Total GHG Emissions, CO_2 (Metric Tons/Year)
Transportation of crude oil from field to refinery	Road	Fuel Use and Vehicle Distance	Heavy Duty Vehicle - Rigid - Diesel - Year 1960-present	747,300	Mile	On-Road Diesel Fuel	870	1,046
Transportation of empty trucks from refinery back to field	Road	Fuel Use and Vehicle Distance	Heavy Duty Vehicle - Rigid - Diesel - Year 1960-present	747,300	Mile	On-Road Diesel Fuel	870	1,046
Transportation of final refined product to end user	Road	Fuel Use and Vehicle Distance	Heavy Duty Vehicle - Rigid - Diesel - Year 1960-present	309,959	Mile	On-Road Diesel Fuel	870	434
Transportation of empty trucks from terminals back to refinery	Road	Fuel Use and Vehicle Distance	Heavy Duty Vehicle - Rigid - Diesel - Year 1960-present	309,959	Mile	On-Road Diesel Fuel	870	434
						Total	**Total**	**2,960**

Assumptions:

1. Since N_2O and CH_4 emissions comprise a relatively small portion of overall transportation emissions, only CO_2 emissions estimates are included

2. Assume tanker truck with capacity of 12,300 gallons = 293 bbl/trip
2,000 bbl/day * 365 days = 730,000 bbl/yr transported = 2,491 trips/yr
** Assume one-way distance of 300 miles = 747,300 miles/yr

3. Assume the total crude refined produces approximately 659,190 bbl/yr of final transported product (90.3% usable product; 6.5% coke; 3.2% still gas combusted at refinery)
** Average one-way distance for transportation of final refined product to end user (assumed within state of UT) to be 150 miles = 309,959 miles/yr

Emission Factor Reference:
World Resources Institute (2008). GHG protocol tool for mobile combustion. Version 2.0

Refinery Emission Calculations

Source Description	Activity Data		GHG Emission	GHG Emissions	
	Production (bbl/yr)	**Production (cu m/yr)**	**CO_2 (metric tons CO_{2e}/cu m)**	**CO_2** (metric tons)	**Total GHG Emissions, CO_2** (metric tons CO2e)
Refinery emissions	730,000	115,873	0.181	21,019	21,019
			Total	**Total**	**21,019**

Assumptions:

1. 1 cu m = 6.3 bbl
2. Average refinery emissions from Canadian Light, Brent North Sea, Saudi Light, 1995 average Syncrude and Suncor, 2005 average Syncrude and Suncor,

Reference:

McCann, Tom, Magee, Phil (1999). Crude Oil Greenhouse Gas Life Cycle Analysis Helps Assign Values For CO_2 Emissions. Oil and Gas Journal, 97 (8).

End Use Emission Calculations

Total Product Produced:	**730,000**	bbl/yr

Product	Product Mix (%)	Product Produced (bbl/yr)	GHG Emission Factors	GHG Emissions
			CO_2 (metric tons CO_2/bbl)	Total GHG Emissions, CO_2 (metric tons CO_2e)
Motor Gasoline	49%	359,160	0.375	134,685
Distillate fuel	25%	181,770	0.43	78,161
Jet fuel	8%	56,940	0.41	23,345
Residual Fuel Oil	5%	37,230	0.45	16,754
LPG	3%	24,090	0.25	6,023
Still Gas (combusted at refinery)	3%	23,360	0.4	9,344
Residual (not sold as product)	7%	47,450	0	0
		659,190	**Total**	**268,312**

Assumptions:

1. Suppliers of petroleum products must report the CO_2 emissions that would result from the complete combustion or oxidation of each petroleum product produced during the calendar year.
2. Calculate CO_2 emissions from each individual petroleum product using Equation MM-1 from 40 CFR Part 86 Subpart MM Suppliers of Petroleum Products
3. Since N_2O and CH_4 emissions comprise a relatively small proportion of overall combustion emissions, only CO_2 emissions estimates are included
4. Emissions factor for motor gasoline assumes the average of various products blend formulations
5. Jet fuel emission factor assumed to be "Kerosene-Type Jet Fuel" referenced in final rule Table MM-1
6. Residual Fuel Oil: Emission factor assumes average of "Residual Fuel Oil No.5 and Residual Fuel Oil No.6" referenced in final rule Table MM-1
7. LPG emission factor assumes 60% propane; 40% butane mix

Reference:

EPA Final Mandatory Greenhouse Gas Reporting Rule. September 22, 2009. 40 CFR Part 86 Subpart MM Suppliers of Petroleum Products
Utah Geological Survey: Utah Energy and Mineral Statistics http://geology.utah.gov/emp/energydata/index.htm

Appendix F - Fishlake National Forest Oil and Gas Construction and Operating Standards and Well Site Design Requirements

Table of Contents

I. Introduction

The following operating standards and well site design requirements are routinely required by the Fishlake National Forest for oil and gas facilities and operations to assure consistency with management objectives for the Forest. These operating standards should not be confused with stipulations contained in the applicable Federal oil and gas lease(s) which specify requirements regarding surface occupancy and timing within the specific areas in the lease. Operating standards must be consistent with the rights and restrictions established in the applicable lease(s) and are applicable to all drilling and production operations, unless otherwise approved by the responsible officer based on site-specific conditions.

These operating standards supplement the general requirements of the Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development (Gold Book) and Best Management Practices in place by the responsible agencies at the time of approval, and the Forest Service, Region 4 Oil and Gas Roading Guidelines. Copies will be made available to operators at first notification of proposed operations.

Authority to require such standards is provided by the Mineral leasing Act of 1920, as amended, Federal Regulations at 36 CFR 228.106-108 (Submission, Review, and Requirements of Surface Use Plans of Operations) and 43 CFR 3162.3 (BLM procedures for approval of post-lease applications for operations).

II. Purpose

These operating standards have been developed to help operators meet agency and Forest requirement when planning operations and preparing their Surface Use Plan of operations and to assure overall consistency with Forest Service management objectives/direction. They have been developed based on experience with oil and gas operations on National Forest System lands as needed to prevent or mitigate effects and conflicts with other uses.

III. Process

Approvals of proposed operations on lease are subject to the application, review, and approval provisions specified in Onshore Oil and Gas Order No. 1, other Onshore Oil and Gas Orders, and all applicable laws and regulations. Surface disturbing proposals must be evaluated under the requirements of the National Environmental Policy Act of 1969 and the Energy Policy Act of 2005. Operators are encouraged to obtain these operating standards from the Forest Service early in the planning and approval process and to incorporate them into their Surface use Plans of Operations to help streamline the NEPA analysis and approval process. If not incorporated into the initial SUPA, the Forest Service will work with the operator to revise the SUPO to include them or may otherwise require them as Conditions of Approval (COA).

Other standards or mitigations may be required based on site-specific evaluations of proposed activities. They may be modified if needed to address site-specific conditions. Operators are required to comply with all other applicable laws and regulations.

IV. Operating Standards

These standards apply to the lease holder, contractors, and their sub-contractors. The term "operator" as used herein, includes the lease holder and/or company authorized to conduct operations on the lease or their contractors, subcontractors and all employees or agents thereof.

1. The operator shall submit for review and approval, a detailed construction and maintenance plan for all exploration and production facilities and roads to be constructed or improved (reconstructed) for operations. Unless otherwise approved by the responsible Forest Service officer, pad designs must be consistent with requirements contained in the Fishlake National Forest Well Site Requirements (Attachment 1). A road-use permit (or specific approval as part of the Surface use Plan of Operations) must be obtained from the Forest Service for commercial use, improvement, and maintenance of National Forest System roads under authority of the National Forest Roads and Trails Act. Road designs must be generally consistent with the Forest Service guidelines provided in the Oil and Gas Roading Guidelines, R-4.
2. The designs for roads, pads, and other facilities are subject to approval by the Forest Service. The designs must be approved and signed by a qualified licensed engineer. Any modifications to approved plans are subject to Forest Service review and approval.
3. Existing roads will be used to the extent possible as long as the existing alignment can be used or improved to the required standard. Additional roads or rerouting of existing road segments, if needed, shall be minimized and approved by the Forest Service prior to construction. Roads or road segments replaced and/or abandoned locations and designs must be generally consistent with the Forests Service guidelines provided in the Oil and Gas Roading Guidelines, R-4.
4. Locate and design roads and drainage structures to prevent slope failure and minimize impacts on water quality. To the maximum extent feasible, locate facilities, including service and refueling areas, on benches upslope from streams, lakes, ponds, riparian areas and floodplains.
5. A pre-construction meeting including the responsible company representative(s), contractors, and the Forest Service must be conducted at the project work site prior to commencement of operations. Earth work must be construction staked prior to this meeting. Approval of the designs and earthwork staking by responsible Forest Service official is required prior to beginning earthwork.
6. A Spill Prevention Control and Countermeasures (SPCC) Plan consistent with the current EPA Region VIII Oil and Hazardous Substances Regional Contingency Plan must be filed with the Forest Service and approved by the authorized officer prior to conducting any construction and operations on National Forest System lands. The plan must address the potential for spills to occur from haulage of materials and supplies to the construction/operations site(s) as well as drilling and production facilities. Material Safety Data Sheets (MSDS) for all potentially hazardous substances used for operations must be available on-site. Operators must be trained in MSDS protocols.

7. All surface disturbing activities, including reclamation, must be supervised by a qualified on-site responsible designated company representative(s) familiar with the approved plans as well as terms and conditions of approval. The designated representatives(s) must be available for contact within the vicinity of the project area or by telephone at all times that operations are in progress. The name and contact telephone number of the designated company representative(s) must be filed with the responsible Forest Service official. A copy of all approved permits with specifications relative to operations in the project area must be available for inspection at the project site.
8. Topsoil must be salvaged from the area to be disturbed, stored, and protected from erosion and contamination until redistributed over re-contoured areas for reclamation. The depth of topsoil to be salvaged must be determined through testing and approved by the Forest Service. Methods of topsoil handling and storage must be approved in project plans and specifications and/or appropriate project permits.
9. All vegetation removed by operations must be stored, used for reclamation, or disposed of as approved in project permits or as specified by the Forest Service. The operator must reimburse the Forest Service for the fair market value of all merchantable timber removed or damaged during operations. Prior to vegetation disturbance/removal all noxious weeds must be removed from the site and handled by approved methods needed to prevent spread of seeds.
10. Where determined appropriate by the responsible Forest Service officer, the operator may be required to bury pipelines and powerlines in or adjacent to roads to reduce surface disturbance and visibility. Designs must provide sufficient depth of cover and signs to indicate the type of pipeline(s), location, and depth to prevent damage from road maintenance and other surface disturbing activities in conformance with applicable Federal and State regulations.
11. Where feasible and appropriate, the operator will be required to centralize production facilities, use telemetry to monitor wells, and delay non-essential maintenance activities in important wildlife habitat during critical seasons of use to reduce the number of vehicle trips to the sites and activity that could disturb or stress wildlife.
12. Where needed to protect wildlife, the operator will be required to construct fences and/or nets on reserve pits or use other approved methods to prevent wildlife use or entrapment.
13. Stream crossings will be planned and constructed to minimize disturbance of the riparian and aquatic habitats by locating crossings at the most advantageous location and by crossing at or near the perpendicular. Structures must be designed to allow fish passage as needed to maintain habitat. Measure must be taken to minimize disruption of stream substrate. When no longer needed for operations, crossings must be removed and the stream and banks restored to pre-disturbance conditions/stream hydraulics. Sediment control measures must be used to minimize sediment introduction during all operations. Timing restrictions (construction and reclamation) may be needed to protect fisheries as coordinated with the Utah Division of Wildlife Resources and through permitting with the Utah Division of Water Rights, Stream Alteration Program.
14. Unless otherwise specified by the responsible Forest Service officer, new oil and gas access roads shall be closed to the public. Operators must construct and maintain gates to Forest Service design standards at intersections of project access roads with national Forest System roads or other highways to prevent unauthorized traffic from entering. A locking system will be required to allow a Forest Service lock in addition to the operator’s lock.

15. Off-road vehicle travel is prohibited unless specifically approved in Project permits
16. Roads used for drilling and production operations which remain open to public traffic must be properly signed to warn the public of project traffic and associated hazards. Signs must be consistent with the Manual on Uniform Traffic Control Devices, Federal Highway Administration.
17. Vehicle operators must obey posted speed restrictions. If speed restrictions are not posted, the operator and contractors must observe safe speeds commensurate with weather and road conditions.
18. Watering and/or application of appropriate dust suppressants shall be used if dust becomes a concern for visibility and sediment transport. Suppressants and application procedures are subject to approval by the responsible Forest Service officer.
19. Unless otherwise approved by the responsible Forest Service officer, all production pads will be fenced to prevent entry by the public and livestock. Designs and specifications are subject to Forest Service approval.
20. Sediment control structures will be used to catch sediment at the base of fill slopes on exploration and production pads. If silt fences are used, they must be constructed with adequate support and maintained to assure that they function at all times, including the winter season and spring runoff.
21. Establishment of staging areas or camp areas outside of the area permitted for surface disturbing operations for project personnel (operator or contractors) on National Forest System lands is subject to Forest Service approval.
22. All permanent survey markers within the area to be disturbed, including section corners, benchmarks, geodetic survey monuments, etc. must be located and flagged for protection prior to any surface disturbance activities. Disturbance or relocation of monuments requires the approval of the agency responsible for their use and preservation.
23. Water needed for operations must be obtained in accordance with State water law. The location and design of diversions on National Forest system lands are subject to review and approval of the responsible Forest Service official.
24. The operator and all contractors shall take measures needed for the prevention of fires started as a result of their operations and to suppress fires that are started as a result of their operations. Fire suppression equipment must be available to all personnel in the project area consisting of shovels, axes, and other appropriate hand tools. At least on properly rated fire extinguisher must be available in each vehicle and around all machinery such that they are readily assessable for suppression of fires. During times of severe fire danger when fire restrictions are implemented by order of the responsible Forest Service officer, all operations must be conducted in conformance with the order. The operator may be required to submit and implement a Fire Prevention/Suppression Plan for review/approval by the responsible Forest Service official.
25. All vehicles and other gasoline/diesel-powered equipment must be equipped with properly functioning spark arresters and mufflers. Spark arresters must meet Forest Service specifications in accordance with USDA Forest Service Spark Arrester Guide.
26. The operator will be held responsible for damage and suppression costs for fires started as a result of operations. Fires must be immediately suppressed to prevent spreading and must be reported to the responsible Forest Service officer.

27. The operator must maintain structures, facilities, improvements, and equipment in a safe and neat manner and in accordance with approved permits. The operator must take appropriate measures in accordance with applicable Federal and State laws and regulations to protect the public from hazardous conditions resulting from the operations. Such measures must include, but are not limited to, posting signs, building fences, or otherwise identifying the potentially hazardous site or condition.
28. All accidents or mishaps resulting in resource/property damage and/or serious personal injury must be reported to the responsible Forest Service officer as soon as possible.
29. The operator may be required to locate pads and facilities in areas where they can be effectively screened from view from sensitive areas. Production facilities must be located and designed to minimize visibility from sensitive viewing areas. Painting of facilities with a non-reflective paint in the color that would best blend with the background will be required. The color will be determined by the operator with approval of the responsible Forest Officer.
30. The operator must comply with all applicable laws and regulations pertaining to the storage, use, and disposal of hazardous substances and solid or liquid waste. All fluids, chemicals, and solid wastes must be properly contained on-site. Reserve pits, catchment ponds, and bermed areas must be constructed to prevent seepage into the ground or adjacent areas. A minimum of 2-feet of freeboard must be maintained in all reserve pits and ponds at all times to prevent overflow and spillage into adjacent areas.
31. Chemical containers should not be stored on bare ground or exposed to the sun or moisture. Containers and labels are subject to degradation and punctured drums could leak contents onto the ground. Chemical containers should be maintained in good condition and placed within secondary containment in case of a spill or puncture. Secondary containment facilities must be of sufficient size to contain all appropriate fluids, including diesel or other fuels.
32. Sanitary facilities must be available to operators and contractors in the project area and properly used and maintained to prevent pollution. The installation of sanitary facilities, other than self-contained chemical toilets is subject to State and Forest Service approval.
33. Unless other methods are specifically approved, all solid wastes, contaminated soil materials, drill cuttings, petroleum products, and other fluids must be properly contained on-site. Disposal of associated waste materials must be at a facility licensed by the State to accept such materials.
34. Harassment of wildlife is prohibited. Pets must be properly restrained to prevent harassment of wildlife, livestock, government officials, and the public.
35. Move-in and move-out of heavy construction and drilling equipment will not be allowed during the opening weekends of the general big-game hunts or holiday weekends (including the observed holiday) from noon the previous day until midnight on Sunday or the observed holiday. Use and maintenance of National forest System roads is regulated under authority of the National Forest Roads and trails Act and the National Forest Management Act.
36. Vegetation seeding methods and seed mixes (species and amounts) used for interim and final reclamation must be approved by the Forest Service. Reclamation and re-vegetation plans and standards for success must be approved in project plans or permits. All vegetation materials, seeds, soil amendments, and sediment control materials must be certified that no noxious weed seed or

noxious weeds are present. The operator is responsible for control and eradication of noxious weeds and invasive plant species in project area until the company is relieved of this responsibility.

37. Vehicles and Equipment shall be free of mud, soil, plant materials, and other debris which could contain noxious weed seeds prior to coming onto the Forest. This is needed to avoid transporting noxious weeds, or invasive species to sites on the Forest.
38. The operator shall follow Forest guidelines designed to prevent the introduction and spread of aquatic nuisance species (Fishlake and Dixie National Forest Supplement, Forest Handbook 2509.16, Chapter 1.
39. The operator shall comply with the following practices to control impacts to ambient air quality from oil and gas exploration and production activities:

a. As appropriate, quantitative analysis of potential air quality impacts will be conducted for project-specific developments by the operator, in concert with direction from the Utah Department of Environmental Quality, Division of Air Quality (UDAQ), the Forest Service and cooperating federal land management agencies including but not limited to the National Park Service. The Forest Service will notify cooperating agencies as project specific proposals are received and additional air impact analyses are performed to ensure input from those agencies. Additional project specific air impact analyses would need to be conducted if the following project criteria are fulfilled:

i. If an exploratory drilling project is proposed within 5 km and or a development/production project is proposed within 60km of any Class I airshed, an air impact analysis would be required prior to any field activity. At a minimum the ISCREEN screening tool will be utilized in the analysis. Additional air impact analyses may be necessary based on the review of the initial VISCREEN analysis.

ii. If an oil and gas production project is proposed at a distance of over 60km from an adjacent Class I area and has emissions that exceed those utilized in the existing “Fishlake 12-well development scenario," a quantitative air quality impact analysis would need to be conducted for the project that follows the guidance found in the FLAG modeling guidelines.

ii. If an exploratory drilling or oil and gas development project is proposed to occur within 60km of an adjacent Class I area and has emissions that are greater than those utilized in the existing "exploratory drilling scenario" but less than those utilized in the "Fishlake 12-well development scenario", consultation with the Forest Service and cooperating Federal Agencies would be required to determine an appropriate assessment of air quality impacts. The level of additional analysis would be predicated on the size of the proposed project.

b. Compliance with Utah Air Conservation (UAC) Regulation R446-1 would be necessary. The best air quality control technology, as per guidance from the UDAQ, will be applied to actions as needed to meet air quality standards.

c. The operator will comply with UAC Regulation R446-1-4.5.3, which prohibits the use, maintenance, or construction of roadways without taking appropriate dust abatement measures. Compliance will be obtained through special stipulations as a requirement on new projects and through the use of dust abatement control techniques in problem areas.

d. The operator will manage authorized activities to maintain air quality within the thresholds established by the State of Utah Ambient Air Quality Standards and to ensure that those activities continue to keep the area in attainment, meet prevention of significant deterioration (PSD) Class II standards, and protect the Class I air shed of the National Parks identified in the Fishlake Oil and Gas Leasing EIS.

e. National Ambient Air Quality Standards will be enforced by the UDEQ, with EPA oversight. Special requirements to reduce potential air quality impacts will be considered on a case-by-case basis in processing land-use authorizations.

f. The operator will utilize BMPs and site specific mitigation measures, when appropriate, based on-site specific conditions, to reduce emissions and enhance air quality. Examples of these types of measures can be found in the Four Corners Air Quality Task Force Report of Mitigation Options, November 1, 2007; EPA Natural Gas STAR Program (http://www.epa.gov/gasstar/); and US Forest Service Emission Reduction Techniques for Oil and Gas activities 2011 (http://www.fs.fed.us/air/documents/EmissionReduction-010711x.pdf).

g. The operator will comply with a Condition of Approval for Applications for Permit to Drill, which includes:

i. All new and replacement internal combustion diesel fired drilling engines must meet or exceed Tier II emissions limits as codified in 40 CFR Part 89 - "Control of Emissions From New and In-Use Non-road Compression-Ignition Engines."

ii. All new and replacement internal combustion diesel fired well pump engines must meet or exceed Tier II emissions limits for Particulate Matter and Tier III emissions limits for Oxides of Nitrogen and Carbon Monoxide as codified in 40 CFR Part 89 - "Control of Emissions From New and In-Use Non-road Compression-Ignition Engines."

iii. All new and replacement spark ignited natural gas fired internal combustion well-pump engines must meet or exceed emissions limits for Oxides of Nitrogen, Carbon Monoxide and Volatile Organic Compounds from New Source Performance Standard Subpart JJJJ for Stationary Spark Ignition Internal Combustion Engines manufactured since 2008.

iv. All new and replacement internal combustion gas field engines of less than or equal to 300 design-rated horsepower must not emit more than 2 grams of NOx per horsepower-hour. This requirement does not apply to gas field engines of less than or equal to 40 design-rated horsepower.

v. All new and replacement internal combustion gas field engines of greater than 300 design rated horsepower must not emit more than 1.0 grams of NOx per horsepower-hour.

vi. All diesel fuel fired internal combustion engines must utilize certified Ultra Low Sulfur Diesel fuel with a maximum sulfur content of 15 parts per million (PPM).

h. Lease holders will need to conduct detailed volatile organic compound (VOC) emissions inventories for any proposed facilities to provide necessary data to the BLM Utah State Office for their regional photochemical modeling.

i. Lease holders will need to examine the use of additional mitigations for ozone precursors.

V. Well Site Design Requirements

A. General Requirements

The operator should propose locating the well site in cooperation with Forest Service personnel on the most nearly level location obtainable that would accommodate the intended use. However, potential well site locations should not be evaluated on the basis of site conditions alone. Access to the well site for road and possible future pipeline locations must also be considered in determining the most suitable location. What may be gained on a good location could be lost from an adverse access route. Plan the well site from the long-term standpoint, assuming a discovery could be made. Future pipeline locations are to be proposed by the operator as a part of his proposal on each well site.

Adjust the well site layout to conform to the best topographic situation. Avoid disturbance of drainages and locate reserve pits away from water courses. Deep vertical cuts and long fill slopes should be avoided. The cut and fill volumes should be balanced, excluding the topsoil and subsoil needed to backfill the reserve pit.

A contour map shall be developed for all well pad locations as an aid in the design of pad settings to the existing topography. This will allow the operator to plan the construction of facilities and the surface manager to evaluate impacts and calculate the bond more expeditiously and accurately. Maps should be prepared to a scale of 1 inch equals 20 feet horizontally and contour interval of 2 feet vertically or as otherwise directed by the responsible Forest Service officer.

Once this information is compiled, finished site elevations, cut and fill slopes and their respective catch points, drainage, balanced earth work, adequate storage area locations and other necessary construction features shall be determined and included with the drawings/specifications. Submittals shall include a well site plan (see Drawing No.1), details of berms, diversion ditches, pits, catchments and other appurtenances and design features. Provide data to support drainage structure design.

B. Clearing

The site must first be cleared of all brush and trees. All merchantable timber must be purchased by the operator prior to cutting, at the appraised price determined by the Forest service. Grasses and small shrubs need not be removed; however appropriate measure will be required to prevent the spread of noxious weeds and nuisance species prior to starting excavations if they occur on the site. Trees and brush will be disposed of by removal from the Forest, by burning, chipping, or other approved methods needed to prevent the spread of insects. Tree trunks less than 8 inches in diameter and slash can be stockpiled at an approved location to be spread over reclaimed areas. Burning permits will be required and are issued by the Forest Service. Burning would only be permitted if the fire danger is low to moderate.

C. Topsoil Removal and Storage

Surface soil material (topsoil), if present, will be stripped from all areas where surface disturbance is necessary and stockpiled. All topsoil will be removed in a separate layer, avoiding mixing with other excavated materials, and stored in a stockpile to prevent loss from erosion or contamination, and from which topsoil may be easily recovered. The depth of surface soil material to be removed and stockpiled will be specified by the Forest Service but will generally include the A Horizon. The topsoil and subsoil stock piles must be located to prevent contamination from the blooie line, flare line, and other operations. Stockpiles shall be contained by silt fencing, ditches and traps or other containment measures to prevent erosion, contamination and loss. If topsoil stockpiles are to remain for more than a single season, seeding with an approved seed mix will be required to minimize loss from erosion and preserve fertility and biological activity.

D. Site Grading

Cut and fill slopes will be such that stability can be maintained for the life of operations. Cut and fill slopes will be constructed as follows (exceptions can be made depending on the type and competency of material encountered):

Height of Slope	Slope
0 – 5 feet	3:1
6 – 10 feet	2:1
Over 10 feet	1.5:1

All fills will be free of vegetation and will be compacted in lifts no greater than 12 inches in thickness to a minimum of 90 percent Proctor dry density sufficient to prevent excessive settlement.

The drill site or pad surface will be surfaced with crushed gravel to a depth sufficient to support anticipated loads throughout the life of the well. Usually a depth of 12 inches of gravel is required.

E. Site Drainage

Diversion ditches having the minimum dimensions of 3 feet horizontal to 1 foot vertical (3:1 ditch) will be constructed around the site to divert existing drainages and surface runoff from flowing onto the site. Hydraulic design for ditches is required to determine capacity. The ditch(s) will be located at the top or base of the cut slope (to be determined based on site-specific conditions) and around the toe of the fill slopes (see Drawing No.1 - Construction Requirements for Typical Well Sites). Straw dykes, catch basins, energy dissipaters or other approved structures will be constructed in the ditch outflow to trap any sediment and dissipate erosive flows. Provide data to support drainage structure designs. A culvert might be necessary where the access road enters the site. A berm will be constructed around the perimeter of the site to contain all precipitation, spills, and other fluids from leaving the site. The berm will be a minimum of 18 inches high, 12 inches wide at the top, and have 1.5:1 side slopes. Berms will be compacted for stability and to reduce permeability as needed to contain fluids. The site surface will be graded at a minimum of 1 percent to drain to the reserve pit. Use silt fencing, ditches and Traps or other containment at toe of fill slopes to prevent erosion and contamination.

The drainage patterns to be constructed will need to be designed for each site, depending on site-specific conditions.

F. Construction and Maintenance of Reserve Pits

Reserve pits will be constructed of sufficient size and capacity for the necessary fluids for drilling and to contain any runoff from the drill site. The pad will be graded to empty into the reserve pit or alternative pit or buried tank. Winter operations may require larger pits/tanks due to snow accumulations and runoff. Pits will not be constructed within intermittent or perennial drainage channels. If the operator has concerns that drainage from the pad could contaminate reserve pit muds, the pad can be constructed to drain into alternative lined pits or buried containment tanks.

It is preferred that pits be constructed in undisturbed materials and below the natural ground level to minimize the risk of failure. Where conditions exist that requires pits to be constructed of embankment materials, the following criteria are required:

1. The area on which the embankment is to be placed will be cleared of all materials including vegetation, topsoil, and unconsolidated soils and gravels.
2. A foundation keyway will be designed and constructed into native materials to dimensions based on site-specific conditions to provide adequate anchoring and sealing of the embankment.
3. The embankment will be constructed using impermeable materials on slopes of 3:1 into the pit and 2:1 outside the pit. The embankment will have a minimum of 10-foot top width. The materials will be compacted to 95 percent Proctor density.

The following are requirements for construction and maintenance of all reserve pits:

1. Pits must be constructed to contain fluids without leaks throughout the life of operations. If pit liners other than clay coatings are used they must be constructed of sufficiently durable and watertight materials to prevent leakage. Compacted bedding material consisting of sand, clay, or other grout may be required to prevent rocks from puncturing the liner and to seal cracks.
2. A minimum of 2-foot freeboard will be maintained in the pit at all times during the drilling operations or if the pit is left un-reclaimed over the winter.
3. If wildlife concerns exist, netting or some other approved method will be used to prevent wildlife use of the pit.

G. Site Reclamation for Nonproductive Wells

Reclamation of the entire site will be required and will commence immediately after drilling, testing, and well plugging/abandonment are complete. The site will be restored to as nearly as practical to its original condition (approximate original contour). Cut and fill slopes will be reduced and graded to conform to the adjacent terrain.

Reserve pits must be allowed to dry before they are backfilled. Fluids that will not dry must be removed from the Forest. All polluting substances or contaminated materials, such as oil, oil-saturated soils and gravels will be removed and disposed of at a State facility licensed to receive these materials. Exceptions to allow for reserve pit solidification may be made if the operator can demonstrate to the responsible Forest Service officer that this method would be effective based on site-specific conditions.

Drainages will be reestablished and temporary measures will be required to prevent erosion on the site until all reclamation and re-vegetation standards established for the site are met.

In general, the well identification standpipe will be set such that it can be buried by at least two feet of soil. A final determination will be made on a case-by-case basis.

After final grading and before replacement of topsoil, the entire surface of the site shall be scarified to eliminate slippage surfaces and promote root penetration. Topsoil will be spread over the site to achieve approximate uniform stable thickness consistent with the established contours.

The site will be seeded and/or planted with a seed mix as approved in the SUPO or as otherwise approved by the responsible Forest Service officer. Nutrients and soil amendments will be applied to the disturbed surface soil needed to meet the re-vegetation standards.

A temporary fence will be constructed around the site until reclamation standards have been met. The fence design is subject to Forest Service approval will be designed to prevent entry by livestock or wildlife as needed for the specific area. The fence must be maintained such that it is functional at all times as intended to prevent livestock use and unauthorized access by the public. The operator is responsible for damages to the reclaimed condition of the site due to unauthorized access until final reclamation standards are met and the fence is removed. The operator will be responsible for eradicating noxious weeds and nuisance species each season until the final re-vegetation standards have been met. Once all reclamation standards have been met, the operator is responsible for removal of the fence, gate, and associated structures and materials.

H. Site Reclamation for Producing Wells

Interim and final reclamation for producing wells will be accomplished for portions of the site not required for the continued operation of the associated facilities. All disturbed surfaces will be treated to prevent erosion and to compliment the aesthetics of the area. A new site plan will be required encompassing the facilities required for operation and interim reclamation measures. Generally, the following measures will be required:

1. The reserve pit will be reclaimed as previously discussed.
2. All polluting substances and contaminated materials, including contaminated soil and gravels will be disposed of as previously discussed.
3. All cut and fill slopes and other disturbed areas not needed for production operations will be contoured to match the surrounding area, top soiled, and re-vegetated as previously discussed.
4. The berm will be reestablished on the production pad where removed to accomplish the reclamation discussed in the previous item.
5. The pad perimeter and reclaimed area will be fenced. Once reclamation standards have been met for the reclaimed portion of the original pad the fence will be relocated on the perimeter of the production.
6. Measures such as painting facilities an appropriate color, and other practical measures will be used to decrease visibility of the site as viewed from sensitive areas such as roads, highways, and recreation areas. Noise suppression devices and submersible pumps (if feasible) may be required as needed to meet scenic, wildlife, and recreation objectives for the area.

I. Site Maintenance

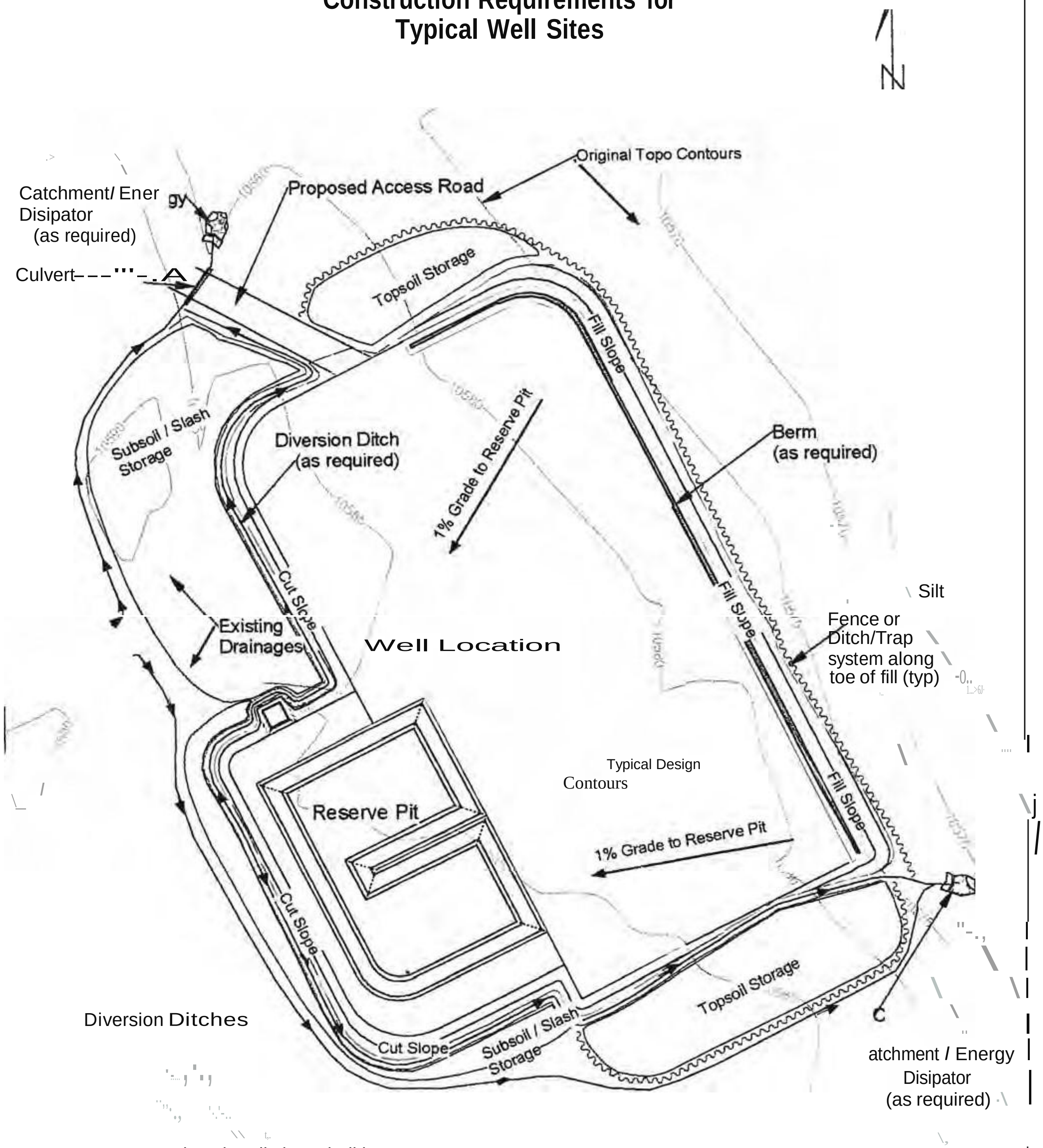
The site will require periodic maintenance to ensure that drainages remain functional and that surfaces are properly treated to reduce erosion, contamination, fugitive dust, invasion by undesirable plant species, and impacts to the adjacent areas.

All garbage, debris, and foreign materials shall be contained on site in a cage or other enclosure then will be removed to an established/licensed landfill or other recognized facility.

J. Site Reclamation for Production Wells

When production pads and production facilities are no longer needed, the facilities must be removed and final reclamation measures completed as previously prescribed for nonproductive wells. Abandoned or unneeded facilities will be removed/reclaimed within two years. In place abandonment of any facilities such as powerlines, pipelines, etc. will require approval of the Forest Service. If approved, appropriate measures to stabilize and decontaminate them will be required.

Drawing No. 1
Construction Requirements for Typical Well Sites



Diversion ditches shall intercept and divert natural drainages and surface runoff around the pad. They shall be designed and constructed to adequately convey calculated event based flows.

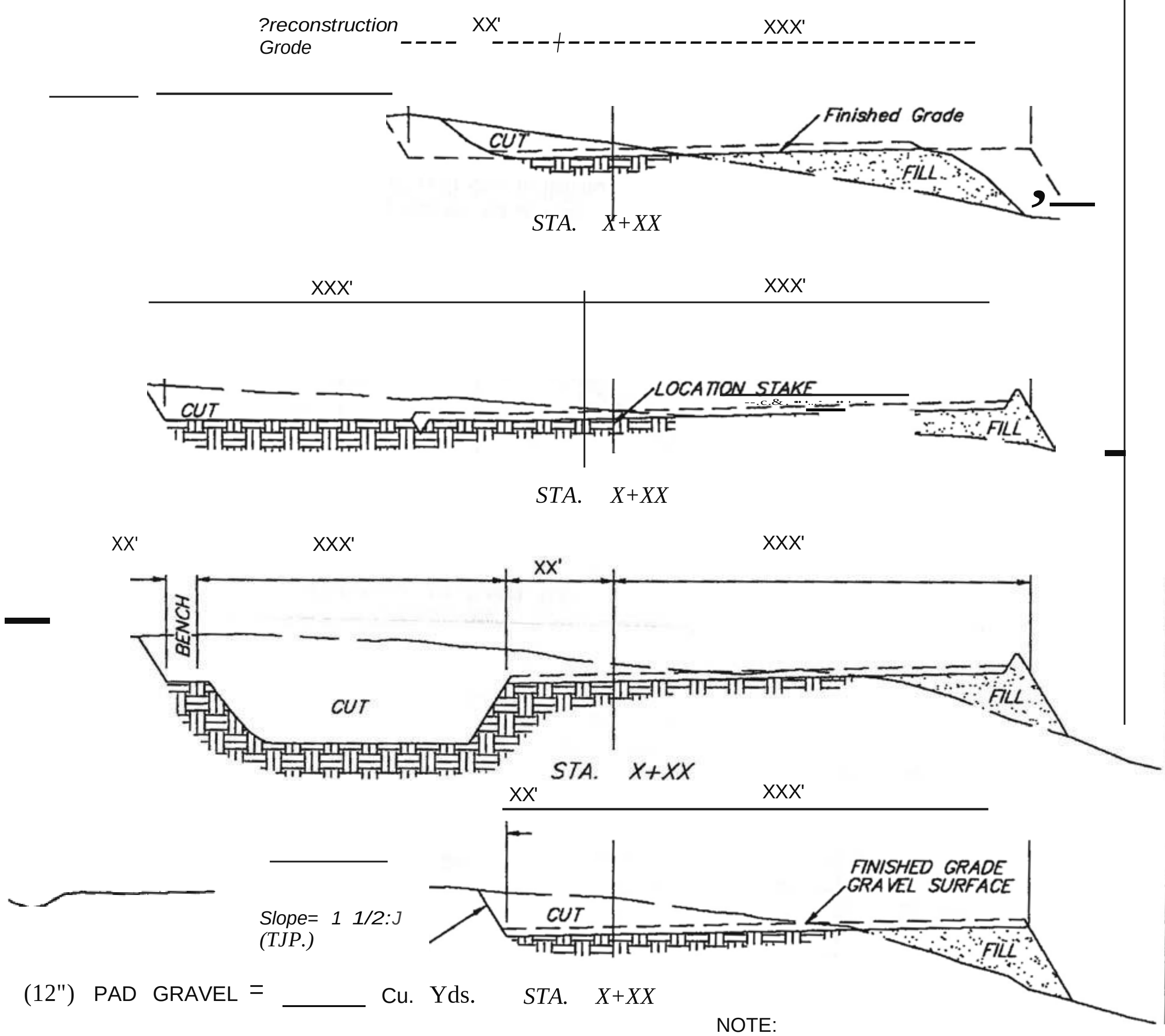
'b
"'

X-Sedion
Scale
1. = 50'

SAMPLE DETAILS

TYPICAL CROSS SECTIONS FOR

WELL NAME & No.
WELL LOCATION



(12") PAD GRAVEL = ______ Cu. Yds.

NOTE:
FILL QUANTITY INCLUDES
FOR COMPACTION

APPROXIMATE YARDAGES

CUT

Topsoil Stripping ____Cu. Yds.
(based on xx")

Remaining (excavation) ____Cu. Yds.

TOTAL CUT = ______CU.YDS.

FILL = ______CU.YDS.

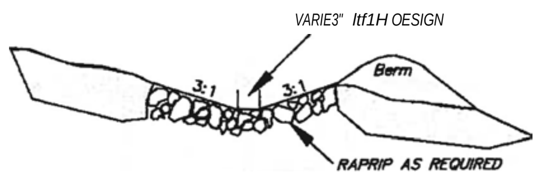
TOPSOIL STORAGE REQUIRED = ____Cu. Yds.

SUBSOIL STORAGE REQUIRED = ____ Cu. Yds.

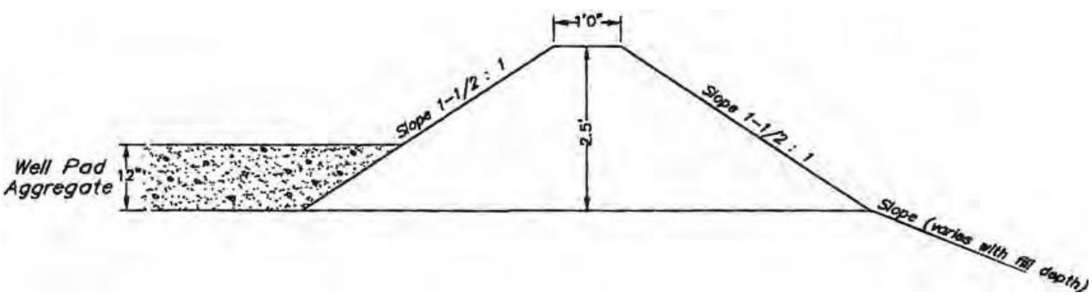
SAMPLE DETAILS

DETAIL SHEET WELL

NAME & No.
WELL LOCATION

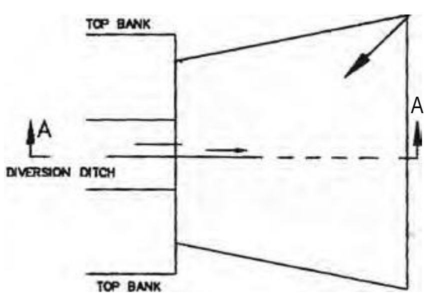


DIVERSION DITCH (DETAIL)
(Only Where Specified)



BERM (EDGE OF LOCATION)
(NO SCALE)

92£ AS REQUIRID



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SECTION *A-A*

PLAN VIEW

ENERGY DISSIPATER (DETAIL)

APPENDIX G – RESPONSE TO COMMENTS

Commenter	Comment	Response
1 - Old Spanish Trail Association (OSTA)	"We wish to register our deep concern about the lack of any acknowledgement of the presence of the Old Spanish National Historic Trail on the Fishlake national Forest, and thus, an absence of an analysis of the potential impact of the proposed actions on Trail resources".	The discussion of heritage resources, and why this is not a key issue has been expanded in the FEIS. This expanded section includes discussion of the OST. A complete discussion and analysis of heritage resources is included in the specialist report, contained in the project record. Under the preferred alternative (Alt. C), all of the historic trails are in areas designated as an NSO or CSU. In the future, any undertaking that has the potential of impacting any of the trail corridors will be subjected to NEPA which includes compliance with Section 106 of the National Historic Preservation Act (NHPA).
	OSTA is concerned "by the absence of any mention of cultural resources in the Key Issues section of the Draft EIS".	The discussion of heritage resources, and why this is not a key issue has been expanded in the FEIS. A complete discussion and analysis of heritage resources is included in the specialist report, contained in the project record. This report outlines the regulatory framework that we are required to operate under when dealing with heritage resources.
	"We did note that national Recreational Trails are discussed in the document. Given the absence of any mention of national Historic Trails, there was thus no opportunity to analyze the distinction between these two types of resources and the differing management strategies that might need to be applied".	At present, there is no management plan either nationally or on the Forest for the OST or FLCO. We understand that the NPS and BLM are presently engaged in this activity. Until we have direction and a management plan for the trails, our segments of the OST and the FLCO will be treated as an archaeological site and will not be opened for large scale public use.
	OSTA requests that the Old Spanish National Historic Trail be specifically and fully addressed in the DEIS including the identification and assessment of potential impacts and appropriate avoidance or mitigation measures.	The discussion of heritage resources, and why this is not a key issue has been expanded in the FEIS. A complete discussion and analysis of heritage resources is included in the specialist report, contained in the project record. This report outlines the regulatory framework that we are required to operate under when dealing with heritage resources.

Commenter	Comment	Response
2 – USDI – BLM, USFWS, NPS , and USGS commented	The BLM is concerned that some of their comments submitted on the administrative draft EIS were dismissed without any rationale or explanation provided. Many of the specific comments attached to their comment letter are the same comments as those that were submitted, but were not addressed.	The Forest Service reevaluated all comments to make sure everything was addressed.
	The delineation of leasing categories and the application and use of stipulations and lease notices appears to be dramatically different between the [Forest Service and BLM]. Stipulations intended to protect resources need to be clarified so that the public knows when and where each stipulation would be applied.	The Forest Service reviewed the stipulations to make sure they are all defined with respect to when and where each stipulation would be applied. All stipulations are defined, as well as mapped in each alternative description, and in Appendixes A and B.
	As was done in Chapter 1, disclosing BLM's regulatory requirements is necessary within the Executive Summary. As such, incorporate 43 CFR 3100 at page S-1, paragraph 4, 2nd sentence: Forest Service and BLM regulations (36 CFR 228.102 and 43 CFR 3100, respectively).	The requested information was incorporated into the Executive Summary in the FEIS, page S-1.
	"The BLM Utah State Director will decide whether to offer for lease those NFS lands authorized for leasing by the Forest Service and make the required leasing decisions for non-federal lands with federal oil and gas ownership within the Forest boundaries." This statement does not describe the process in enough detail. BLM does not decide what and how to lease within the FNF. There is still a secondary process that must happen before any land is leased between the USFS and BLM. This process should be explained fully.	This sentence was edited in the FEIS and is found at page S-2.
	1.7.2 Roadless Area Conservation Rule and Legal Activity This section must be updated and incorporate recent court decision.	The discussion was revised to incorporate these changes in the FEIS, and can be found at pages 5-7.
	1.9.2 Non-key Issues This section must be updated and incorporate recent court decision.	The discussion of why IRAs is not a key issue is not changed due to the most recent court decision regarding the RACR. This discussion is found in section 1.8.2 in the FEIS

Commenter	Comment	Response
	In the steps of oil and gas development, step 4 should state that the USFS attaches the appropriate stipulations and lease notices to the lease before returning their recommendation to the BLM. Incorporate a missing step- an APD being filed by a proponent. The way it is presented now leads the reader to conclude that a SUPO is reviewed immediately after a lease is issued which is not the case.	The discussion was edited to incorporate these changes in the FEIS and can be found at page 15.
	Lease notices are not stipulations nor are they a leasing category like NSO, CSU, and SLT&C. Lease notices may be attached to any lease regardless of the leasing category and regardless of what stipulations are eventually included in the LUP. Stipulations are legally binding. Lease notices are non-binding and should be under the SLT&C category of leasing for this purpose. Stipulations cannot be layered and should be represented by the most restrictive one on the map. This is a dramatic departure from the traditional definitions of leasing categories and has no connectivity to the BLM's leasing process.	All maps were re-created to show only one lease stipulation on any piece of land, as well as to remove any delineation of lease notice on any map. Maps in the FEIS correctly display the correct leasing category for each piece of land under each alternative. The maps are displayed in Chapter 2 of the FEIS.
	The category SLT&C w/ TL appears to be incorrect. The acres have to be one or the other and they cannot be SLT&C if they have a TL stipulation. Similarly, the category LN w/TL means that it is issued under SLT&C with additional information. However, when TL is added it is no longer SLT&C.	Maps and associated tables have been corrected for the FEIS.
	Table 2.4-2 - Sage grouse and big game – Sage grouse are not included within the table.	Sage grouse and big game are grouped in the effects summary table at the end of Chapter 2.
	Geologic Hazards and Steep Slopes: Miles of road/acres of disturbance on steep slopes or unstable soils - The numbers are the same on the surface because the RFD does not change; however, stipulations preventing development near waterways, on steep slopes, and on	The RFDS predicts approximately 45 exploration wells, 30 production wells, about 60 miles of new roads (for exploration and production), and about 100 miles of light to heavy road reconstruction associated with O&G lease activities. Total gross surface disturbance (before

Commenter	Comment	Response
	unstable slopes would reduce the amount of soil loss. If there are “0” miles of road how can there be the same amount of disturbance?	reclamation) from all these facilities would be about 1,420 acres (~2.2 square miles or about 0.8% of the Forest) for all action alternatives. Total net disturbance would be approximately 350 acres (~0.6 square miles or about 0.02% of the Forest) that would not be reclaimed but would be in use for O&G production for all action alternatives. The same RFDS exists for all action alternatives. Since the same amount of roads is being proposed under the RFDS, then we could expect the same amount of disturbance. Only under the no-action alternative would there not be any road construction. This information has been added to the FEIS.
	3.3 Effects of the Alternatives on the Reasonably Foreseeable Development Scenario: Footnote under Table 3.3-1 This is a critical analysis assumption that requires additional discussion in the main section rather than as a footnote. There also needs to be more explanation as to why a 50 percent reduction is assumed for Alternative D. There is not enough information to determine whether this is a reasonable assumption. If approximately 50 percent of the lands on the FNF are closed to leasing, then a 50 percent reduction in well count and disturbance may be appropriate. Also consider whether areas that will be closed are in high potential areas. If the high potential areas are still open under alternative D, there may be minimal differences between the alternatives. For an example consider looking at the Vernal Draft RMP EIS Section 4.8, Tables 4.8.2-4.8.5. This concept might have an effect throughout the EIS.	Land that would be designated as NL or NSO under Alternative D was compared to the Oil and Gas Occurrence Potential, and Oil and Gas Development Potential maps contained in the RFDS report. It was determined that the land that would be available for lease under Alternative D falls largely under moderate and high occurrence and development potential. Therefore, analysis assumes full development as predicted in the RFDS for all alternatives. This discussion and associated table was corrected for the FEIS.
	It is unclear if the citation Rodriguez, RL (2006) version 4.2 includes or incorporates the State of Utah’s (Utah Division of Wildlife Resources) list of sensitive species. The BLM requires the use of State of Utah’s list of	Rodriguez (2006) includes vertebrate and plant species listed as Threatened, Endangered, or Candidate for listing with the USFWS, vertebrate and plant species identified as Sensitive by the Intermountain Region of the USFS (R4

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	sensitive species. The State of Utah Sensitive Species List and associated appendices are located here: http://dwrcdc.nr.utah.gov/ucdc/ViewReports/SSLAppendices20110329.pdf.	Sensitive) and vertebrate Management Indicator Species identified in the Fishlake NF Land and Resource Management Plan (LRMP). While there is substantial overlap between the species covered in Rodriguez (2006) and the State of Utah Sensitive Species List, many species not typically found on the FNF are not included.
	3.5.2 General Effects to Wildlife "The disturbed area and surrounding habitat (at least ¼ mile radius)"requires a citation. This ¼ mile radius applies to pronghorn, but it requires a reference. If a citation cannot be applied then it should be removed.	Text "at least ¼ mile radius" was removed since disturbance distance varies by species and this section deals with wildlife in general. More specific discussion of disturbance distance is provided in individual species analysis when this data is available. Guidelines and supporting data can be found in USDI 1995.
	3.5.3.1 Federally Listed Threatened, Endangered, or Proposed Terrestrial Wildlife - All of the area would be considered CA condor foraging habitat or at least potential foraging habitat and should be analyzed as such.	Analysis was updated to clarify the potential extent of O&G development on California condor foraging habitat.
	Table 3.5-3 Elaborate on "Potential California condor habitat (acres) subject to oil and gas activity subsequent to leasing". It is unclear what is being defined. This needs an explanation is the rest of the area NSO under that alternative or is it NL?	The heading for the table was changed to clarify reference to CACO rim habitat not covered under NSO by over- lapping resource protections.
	3.5.3.1 Federally Listed Threatened, Endangered, or Proposed Terrestrial Wildlife: All T&E species: General Effects or in the Determination Section on page 81 Should mention the lease notice that was developed in coordination with USFWS and that will be attached to leases within the FNF in Chapter 3 section 3.5.3.1 for all species and discuss how this is mitigation and at the project stage additional consultation will be required. Format for Determination is different for some of the species – some it is lumped, others it is split by alternative.	Added text under heading for section 3.5.2.2 *Federally Listed Threatened, Endangered, or Proposed Terrestrial Wildlife* to clarify – "A lease notice was developed for each listed species within the FNF in coordination with USFWS and will be attached to leases. The lease notice includes minimization and avoidance measures designed to assure activities carried out on the lease are in compliance with the Endangered Species Act. Additional consultation with USFWS will be required at the project stage." This is found at page 75 of the FEIS.

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		Determinations for alternatives with similar effects were sometimes grouped in the analysis to conserve space.
	Mexican Spotted Owl: on page 83 Effects Specific to Alternative D LN's are referred to as stipulations – this is not true. This needs to be corrected.	The correction was made in the FEIS.
	Utah Prairie Dog – Effects Specific to Alternative A It states that there are no leases in the FNF but in the RFDS it states that there is one lease currently.	The correction was made in the FEIS.
	Utah Prairie Dog – Effects Common to Alternatives B &C This section states that "….due to lease stipulations requiring the lease holder to avoid surface occupancy or disturbance…." However there is not a lease stipulation provided for the UT prairie dog in the Appendix, it is a lease notice which is very different. The last sentence does say that a lease notice would apply – this information needs to be consistent.	The correction was made in the FEIS.
	3.5.3.2 Forest Service Region 4 Sensitive Wildlife Species: the Section in general Verify that all species are addressed consistent with the Utah Sensitive Species List and are included in this document. The BLM sends a lease list to the Utah Division of Wildlife Resources for coordination. If a sensitive species is not specifically covered or addressed, provisions to protect that species adequately is not made, leasing will likely be deferred.	The FNF is responsible for managing all surface resources on federally owned land within the boundaries of the forest. All federally listed species, R4 Sensitive species, and MIS species that occur, or are likely to occur, on the FNF within the life of this document were analyzed in the specialist report.
	Effects Specific to Alternative B - This section illustrates that the lease categories" are misunderstood. There is no such thing as timing limitations under SLT&C – it is either TL or SLT&C.	This was corrected in the FEIS.
	Effects Specific to Alternative C "If all development were to occur within pygmy rabbit habitat, up to 2.3% of the available habitat on the forest would be directly impacted by oil and gas activities predicted in the RFDS." How is this correct if all of the known habitat is NSO? Also	Under alternative C, NSO would only apply to known colonies. The remaining potential habitat would be SLT and therefore open to impacts from development. Development could be moved 200 meters to avoid any new colonies, but this would not be required on potential

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	in Alt. B you can move the 200 meters and there is no effect, so why isn't that the case here.	habitat if no PYRA occupancy was detected during surveys.
	Bighorn Sheep - A TL stipulation for lambing and winter for Bighorn in one of the alternatives must be considered.	Bighorn use of habitat on the FNF is a recent event resulting from expansion of populations along the eastern edge of the forest. At present, UDWR has not delineated key occupied habitat for this species on the FNF and all habitat modeled for analysis in this document is considered potential. To address this comment a lambing TL and a wintering TL was added to Alt C for occupied bighorn sheep habitat in the event the proposed Canyon Mountain bighorn transplant or other relocations occur prior to leasing. NSO stipulations for wintering and lambing habitat were added to Alt D.
	Effects Specific to Alternatives A & D The following statement is in many of the sections "Similarly, no impacts to big game habitat or populations will likely occur from the implementation of Alternative D, because no surface activity would be allowed on ….." NSO is not applied to cover a specific resource in most instances, it happens to also protect other resources at the time. If there is an EMW applied on that NSO that should also be taken into consideration. This applies to other sections/pages too.	Actually, in all instances NSO is applied to cover specific resources. An EMW would be granted only if all impacts concerns could be mitigated.
	Pg. 109 Missing Section Missing a section - Effects Specific to Alternative D	Effects for alternative D are the same for alternative A. Therefore effects for alternatives A and D are grouped together.
	Effects Specific to Alternatives B, C, D "Of the three action alternatives, Alternative B would subject the most (100%) amount of potential cavity nesting bird habitat to oil and gas development, and alternative D would subject the least amount (4%) of potential habitat to development. Alternative C (50%) is between B and D." It is unclear how or why is this the case – are there specific	The analysis is based upon over-lapping protections, where protections for all resources on a given section of ground are combined and the most restrictive (NSO) is applied. NSO designation for resources such as IRAs, slope and riparian areas benefit wildlife by restricting oil and gas activities. The area of the FNF under the NSO stipulation, and the amount of habitat open to development, increases

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	stipulations or other resources stipulations that cover this habitat?	from Alternative B (least) to D (most) and potential impacts from oil and gas activities would have a similar variation. Table captions were updated to clarify this point.
	Effects Specific to Alternatives B, C & D "Of the three action alternatives, Alternative B would subject the most potential riparian nesting habitat (14,946 acres or 100%) to oil and gas development." This is not enough information to analyze the difference or to tell the reader what the difference is between the alternatives.	The analysis is based upon over-lapping protections, where protections for all resources on a given section of ground are combined and the most restrictive (NSO) is applied. NSO designation for resources such as IRAs, slope and riparian areas benefit wildlife by restricting oil and gas activities. The area of the FNF under the NSO stipulation, and the amount of habitat open to development, increases from Alternative B (least) to D (most) and potential impacts from oil and gas activities would have a similar variation. Table captions were updated to clarify this point.
	Table 3.5-21 Potential northern flicker habitats subject to oil and gas activity subsequent to leasing. The origin of these numbers is unclear. Are there other stipulations that apply to the area that will prevent development in N. Flicker habitat – this should be explained.	The analysis is based upon over-lapping protections, where protections for all resources on a given section of ground are combined and the most restrictive (NSO) is applied. NSO designation for resources such as IRAs, slope and riparian areas benefit wildlife by restricting oil and gas activities. The area of the FNF under the NSO stipulation, and the amount of habitat open to development, increases from Alternative B (least) to D (most) and potential impacts from oil and gas activities would have a similar variation. Table captions were updated to clarify this point.
	3.11.2, Effects to Vegetation Some discussions are unclear. Where or when is CSU applied? When other provisions to protect vegetation are applied, these stipulations need to come forward.	The 1 mile NSO covers the following species; Maguire daisy Pinnate spring-parsley, Rabbit Valley gilia, San Rafael cactus, Last Chance Townsendia (Table 3.11-2). The CSU is applied for all other plants on the R4 Sensitive plant list for the Fishlake NF and for the MIS plant species on the Forest (DEIS pg. 153).
	Alternative C Bicknell milkvetch has 66% of its known locations falling within moderate or low potential development areas. One third of the locations that are	There is a 1 mile NSO for T and E plant and some sensitive plants (Table 3.11-2). Some of the other Sensitive species habitat falls within an NSO for other resource

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	within the high development potential area are within a NSO. It is unclear how the 1 mile of NSO is applied. Is there a 1 mile NSO for plants under this Alt? Table 3.11-3 (Sensitive Species with NSO Protection) states that these species are covered by a NSO from other resources. This is not reflected in the stipulation table. Alternative C also has a CSU stipulation for known sensitive and MIS plant habitat. Pad development sites within one mile of known occupied habitat are subject to this stipulation, and drill pads may be moved up to ½ mile from occupied habitat.	considerations. Bicknell milkvetch is not one of those species. This species is covered under a CSU (DEIS 153)
	Alternative D The effects to sensitive species that are not MIS plants have not been addressed.	There is a NSO in place for all Sensitive plant species under this alternative. This includes all known occupied habitat and a 1 mile buffer around that habitat (DEIS pg. 33). The Affected Environment section also identifies that there will be "no impact" to Sensitive plants under this alternative (DEIS pg. S-14).
	3.12 Air Quality It states "Further discussion of the analysis process is discussed in the Air Quality Modeling Report contained in Appendix D." However, Appendix D is not provided to the	Appendix D was published and a second comment period opened to provide readers the opportunity to comment on it.
	3.12.3 Impacts Common to All Alternatives It states "As discussed in Appendix E, CO2 emissions…" However, Appendix E is not provided to the reader.	Appendix E was published and a second comment period opened to provide readers the opportunity to comment on it.
	3.17 Other Required Disclosures - The statement: "The Fish and Wildlife Service concurred with the findings in the wildlife and plant Biological Assessments as required by the Endangered Species Act" leads the reader to believe that a biological opinion has been provided. USFWS advises that it is still pending.	A final BO dated January 19, 2012, was sent to FNF supervisor Allen Rowley and is on-file at the FNF SO in Richfield, Utah.
	Appendix A NSO for Riparian Areas and Wetlands – it is unclear what distance around riparian areas or wetlands is NSO.	Corrections and additions were made to the description of stipulations to clarify where and when each stipulation applies, and under what circumstances a WME might be granted.

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	Appendix A NSO within Sage Grouse Leks, Brood-rearing, Nesting and Winter Habitat –all of the leks should be mapped within brood-rearing, nesting and winter habitats; otherwise a buffer to protect the lek should be applied.	The NSO stipulation specifies a 4 mile buffer around leks (Appendix A).
	Appendix A All of the CSU and TL stipulations must include pertinent information for the lessee in the stipulation not in the purpose statement. For instance "CSU in Goshawk Post Fledgling Areas (PFA)" does not tell the lessee or reader what the stipulation is, it needs more information and should include: Surface occupancy or use is subject to the following special operating constraints. Prior to any surface disturbing activity in a goshawk PFA, a two-year protocol survey would be required and would need to be completed between March 1 and September 30. If any occupied or active nests are found within the PFA, high intensity oil and gas activities such as construction and drilling will be restricted in the area of the PFA from 1 March to 30 September or until birds have fledged as determined by District Wildlife Staff. This concept should be carried forward on all stipulations.	Corrections and additions were made to the description of stipulations to clarify where and when each stipulation applies, and under what circumstances a WME might be granted (Appendix A).
	Appendix A The TL for Sage Grouse (Structures in Winter Habitat) is unclear to the reader and requires clarification.	Corrections and additions were made to the description of stipulations to clarify where and when each stipulation applies, and under what circumstances a WME might be granted.
	Appendix A TL for Goshawk Nest and Nest Replacement Areas – is there a buffer to go with these dates and the dates and information need to go up into the stipulation like the others.	Stipulations clarified as to where and when each stipulation applies, and under what circumstances a WME might be granted. Goshawk core nesting areas were moved under a NSO stipulation.
	Appendix A The CULTURAL RESOURCES and the THREATENED OR ENDANGERED SPECIES lease notice must be separated and apply individually.	This is the standard Forest Service Lease Notice, written as is.

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	Appendix A Lease Notice – Bald Eagle – this lease notice was prepared when it was a T&E species and does not reflect current protective measures.	While no longer a listed species, the bald eagle is a Utah Species of Concern and receives additional protection under the Bald and Golden Eagle Protection Act. It was decided that including the LN for bald eagle would insure compliance with this act.
	Appendix A - Condor "Lessee is responsible to remove big game carrion to 100 feet from on lease roadways occurring within foraging range as feasible in…." Change to - Lessee is responsible to remove big game carrion to 100 feet from lease roadways occurring within foraging range as feasible in.	This change was made as requested in FEIS.
	Appendix A According to the information presented in Chapter 3, the Lease Notice- Endangered Fish of the Upper Colorado River Drainage Basin is not necessary because the species are not present within FNF.	The Lease Notice- Endangered Fish of the Upper Colorado River Drainage Basin section has been removed. Additional language has been added to the EIS further clarifying that Fishlake N.F. streams drain into the Colorado River within Lake Powell below designated critical habitat for Colorado River fish.
	Appendix B – Utah Prairie Dog Habitat - There are two maps in Appendix B for Wildlife (Endangered, Threatened and Candidate Species Habitat) and appear to be identical. The legend state "Utah Prairie Dog (Critical Habitat)". Critical habitat has not been designated for this species and this term should not be used. It also creates an inconsistency between the maps and the text in Chapter 3.	The map contained in the FEIS does not use the term "critical habitat", and the duplicate map was removed from the appendix.
	Appendix B – Greater Sage Grouse The document is inconsistent in the placement of greater sage-grouse. Within Table 3.5-1, greater sage-grouse are listed as a candidate species and as an Intermountain Regional Forester's Sensitive Species. On the map in Appendix B for Wildlife (Endangered, Threatened and Candidate Species Habitat), greater sage-grouse are not shown. They are shown on the Wildlife (Sensitive Species) map. It	Greater sage-grouse currently have both Candidate Species status with the USFWS and R4 Sensitive species status with the Forest Service. Since sage-grouse have not yet been listed, there was no consultation with the USFWS for this species and sage-grouse were analyzed as R4 Sensitive in this document. However, to acknowledge candidate status sage-grouse are also listed in sections and tables dealing with federally listed species (i.e. Table 3.5-1). When this

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	would be helpful to have sage-grouse in only one section. The Wildlife (Sensitive Species) map would be clearer if the legend matched the stipulation language. For example, Alternative C has stipulations for "sage grouse leks and nesting habitat", sage grouse brood-rearing areas and sage grouse wintering habitat. The map shows "Sage Grouse Habitat" and "Sage Grouse Lex". Also, in Table 2.4-2, there is a comparison of road density in sage grouse and big game habitat by alternative. However, data are only presented for big game habitat.	occurs the reader is directed to the sections of the document (Sensitive Species) dealing with sage-grouse. Analysis was updated to consistently use UDWR terms of "occupied", "brood" and "winter" habitat. A road density analysis for greater sage-grouse was added to Table 2.4-2.
	The USFWS supports the large extent of No Surface Occupancy (NSO) designation under the agency preferred Alternative C, and believes that this designation will help provide protections for many fish and wildlife resources on the Fishlake National Forest (Forest). They support the protection of Inventoried Roadless Areas under the NSO designation, as these areas provide important wildlife habitat and protect biodiversity. They also support the array of special habitats and sensitive species populations that are designated NSO under Alternative C. The areas protected under stipulations may change through time, however. Because plants, wildlife and their habitats are dynamic, it is likely that new populations may be discovered, existing populations may move, species may decline or recover, and important habitat areas may change through time. USFWS recommends the final EIS identify how areas under protective stipulations will be updated as species occurrences and crucial habitats change throughout the timeframe of future leasing activities.	Plants and animals are protected with stipulations, lease notices, conditions of approval, and additional mitigation measures, based on site-specific analysis at the APD stage. The stipulations applied as a result of this leasing analysis will be amended to the Forest Plan. These cannot change unless a new programmatic analysis is completed, and a Forest Plan amendment prepared, or the Forest Plan is revised. The stipulations are not likely to be changed until the next Forest Plan revision, or unless there is a very compelling reason to consider a Forest Plan amendment.
	Migratory Birds USFWS recognizes the efforts and commitment of the Forest to protect, restore, and conserve habitat of migratory birds. In a letter (dated	More explanatory text was added to migratory bird section. "Protective measures to minimize negative impacts to migratory birds during the nesting season are specified in

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	August 1, 2007) to the USFWS, the Forest describes the strategy for addressing its Executive Order 13186 responsibilities relative to: project planning; impact assessment; initiating avoidance and minimization actions; proactive migratory bird conservation; and identification of conservation and mitigation measures aimed at conserving bird habitats and populations. The draft EIS does not clearly state measures that will be implemented to protect, conserve, and restore migratory bird habitats during oil and gas exploration and development. USFWS recommends that the final EIS clearly identify management practices that will be required in order to avoid take of migratory birds during construction activities. In addition, USFWS recommends priority migratory bird habitats (e.g., riparian) on the Forest be defined and projects that will impact these habitats be required to minimize and mitigate their impacts. Finally, USFWS recommends that the final EIS, to better address the Forest's migratory bird strategy, describe more fully the conservation and mitigation measures which would offset impacts associated with oil and gas leasing (and the potential connected actions of exploration and development). They also recommend that the final EIS describe more fully what activities the Forest is and will be undertaking to improve migratory bird habitats, particularly relative to migratory bird species of concern. These efforts are integral to the strategy as outlined in the 2007 letter and will help identify the measures the Forest is taking to comply with E.O. 13186.	the Migratory Bird Lease Notice (Appendix A) and may be applied at the APD and field development levels on a project specific basis."
	Page 30, Sec. 2.2.3, Alternative C: It is unclear from the simple list how the areas were defined and delineated, and how they will be inventoried and updated through	The Public Involvement, Issues and Alternatives Considered in Detail sections explain how public input was used and alternatives were developed. These discussions are found

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	time. We recommend the final EIS describe how these areas were identified and mapped, where more information can be found in the document, and how future updates will be incorporated.	at pages 10 -14, and 25 – 35 of the FEIS. The areas in Alternative C are all mapped as either part of the Forest Planning process and are already identified in the FNF Forest Plan, or they were mapped by the appropriate specialist depending on the resource, or in some cases they were mapped by a state agency such as DWR, or other federal agency such as USFWS depending on other laws or regulation (e.g. Endangered Species Act). The stipulations were edited to better explain how, and by whom the areas under a stipulation were mapped.
	Page 38, Table 2.4-2: It is unclear why sage-grouse and big game are grouped together for the road density analysis. It seems there may be substantial overlap between sage-grouse and big game habitats. In addition, effects to big game are provided, but there are none listed for sage grouse. We support this analysis, and recommend the inclusion of all habitats that may be impacted by oil and gas development. We recommend you either include or eliminate sage grouse from the analysis, and consider expanding the road density analysis to more species' habitats if necessary.	Sage grouse were added to analysis. This analysis may be applied to more species at the project level where more details will be available and the analysis will be more relevant.
	Page 42, Section 2.4: We recommend you include a table summarizing the effects of each alternative on the federally listed and sensitive plants.	Table 2.4-2 summarizes effects on listed and sensitive plants.
	Page 96, Sec. 3.5.3.2, Greater sage-grouse: The proposed Timing Limitations (TL) will provide protection to sage-grouse habitats from construction disturbance, but operations will occur and structures be present during brood rearing and wintering habitat periods of use by grouse. Facilities such as well pads, compressor stations, roads, and transmission lines adversely impact sage-grouse habitat; therefore, direct and indirect impacts to sage-grouse may be greater than "negligible-to-minor,"	While the timing limitations in Alternative C will mitigate impacts primarily during construction, the analysis and determination are driven by the 4 mile NSO buffer around active leks. When the lek buffer is added to NSO for other resources, more than 80% of occupied sage-grouse habitat will be NSO. This means that "Facilities such as well pads, compressor stations, roads, and transmission lines" will not be allowed on >80% of sage-grouse habitat and therefore no adverse impacts from oil and gas would occur on >80%

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	despite the TL. We also recommend the term “critical habitat” be changed to “important” or “crucial” habitat, to minimize confusion with formally designated critical habitat. There is no existing or proposed critical habitat, as indicated in the last paragraph, as the species is not federally listed.	of sage-grouse habitat. Also, none of these developments will occur on sagebrush habitat within 4 miles of an active lek where some of the most important sage-grouse habitat is found and a large proportion of use occurs.
	Page 115, Table 3.5-20: Given that Alternative C allows no surface occupancy within 300 feet of riparian areas, it is unclear how 2,882 acres of potential riparian nesting bird habitat could be open for development. Please clarify. If this number is correct, then we recommend more stringent measures be established to better protect this priority habitat.	This discrepancy resulted from differences between the riparian protection coverage (300 foot buffer) and the riparian nester potential habitat coverage, which was more conservative. This is not uncommon in GIS analysis done on a landscape scale and is generally corrected at the project level.
	Page 146, Sec. 3.10.3, Effects to Resident Trout: We support the NSO designation which will provide a 300- foot riparian buffer under the preferred alternative. While the Forest may restrict drill pads within the NSO area, contamination of aquatic systems can occur as a result of malfunctions or leakages of pipelines, reserve pits, evaporation ponds, and other infrastructure. We recommend the EIS evaluate the risk of drilling by-products or related contaminants reaching streams with aquatic biota. To reduce the risk of contaminants or their by-products reaching streams with aquatic biota, we recommend you implement the management practices described in Department of Interior’s Hydraulic Considerations for Pipeline Crossings of Stream Channels.	The scope of this decision is which lands are appropriate for leasing. The Department of Interior’s *Hydraulic Considerations for Pipeline Crossings of Stream Channel* publication provides useful information for pipeline stream crossing, primarily to ensure aboveground pipelines are high enough to escape flood damage, and buried pipelines are deep enough to withstand scour from flood events. The risk of contaminants reaching streams and the specific nature of pipeline crossings will be evaluated and analyzed in site specific development NEPA.
	Page 149, Table 3.11-1 and page 151, Table 3.11-2: Maguire daisy (Erigeron maguirei) is no longer a federally-listed species. It was de-listed on January 19, 2011.	It is correct that this species is no longer federally listed. It is a Forest Service Sensitive species known to occur on the Fishlake NF. The same protections apply to this species as to the federally listed plants in accordance with the Central Utah Navajo Sandstone Endemics Conservation Agreement. The FEIS documents this species appropriately.

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	Page 150, Section 3.11.2, Alternative B: If all but one of the known populations of threatened or endangered plants are within areas of high to moderate development potential, then development under this alternative would be likely to adversely affect these species or their habitat. We recommend you reconsider your “may affect, but not likely to adversely affect” determination (page 151). It is unclear how federally listed plant populations found during clearance surveys would be addressed in a development scenario. In absence of NSO protection for these populations, we recommend you work with the USFWS Utah Field Office to develop lease notices for these species.	The Biological Opinion (BO) provided by the FWS determined that “the action, as proposed, is not likely to jeopardize the continued existence” of the listed plant species (BO Jan 19, 2012). The FEIS uses the same determination language as the BO.
	Page 151-153, Section 3.11.2, Alternative C and D: Alternatives C and D provide protective buffers around known populations of listed plants. Please clarify what is meant by a “known” location. Without knowledge of the full distribution of listed plants in the project area, a “no effect” determination is not possible unless "known" locations include those discovered during clearance surveys. It appears from the DEIS that additional locations will receive some additional protections, but there is no reference what these protections would be. We recommend you extend the NSO stipulations to populations found during clearance surveys and avoid any populations located within seismic exploration corridors.	The Biological Opinion provided by the FWS determined that “the action, as proposed, is not likely to jeopardize the continued existence” of the listed plant species (BO Jan 19, 2012). Any reference e to the “no effect” determination will be changed in the FEIS.
	Page 182, Sec. 3.17, Other Required Disclosures: The USFWS has not completed formal consultation with the Forest, and a biological opinion is still pending.	A BO dated January 19, 2012 is on file at the FNF Supervisor’s Office in Richfield, Utah.
	Page 182, Sec. 3.17, Other Required Disclosures: The following sentence is awkward and should be rephrased: “Oil and gas leasing with BMPs properly implemented,	This sentence was re-written to be clearer in the FEIS.

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	including appropriate surveys and mitigations (of the locations) prior to disturbance, would prevent take…" It is also unclear what BMPs it is referencing. Please clarify.	
	Appendix A, Table A-1, No Surface Occupancy Stipulations: It is unclear if the NSO designation includes a buffer for riparian areas, wetlands, known pygmy rabbit colonies, key habitats for boreal toads, or bald eagle winter concentration areas. Development immediately on the edges of these areas would incur impacts to those habitats. We recommend that buffers be included in the NSO designations for these areas and that the buffers be identified in the final EIS.	NSO means no surface occupancy in the ENTIRE area delineated. There is no need for an additional buffer around areas that are already encompassed in a NSO stipulation. The size of the buffer is developed based on how much area needs to be protected to mitigate impacts to the resource in question.
	Page 182, Sec. 3.17, Other Required Disclosures: The USFWS has not completed formal consultation with the Forest, and a biological opinion is still pending.	The Forest Service has completed the required formal consultation. The USFWS issued a biological opinion to the Forest Service on January 19, 2012.
	Appendix B, Lease Stipulation Maps: The Vegetation and the Wildlife maps identify sensitive species locations with simple buffers which do not provide adequate location protection for publication in a public document. In the future, we strongly recommend that you refrain from mapping these locations, map only suitable habitat, or provide a large, irregular buffer. In addition, we note the following: • Boreal toad and raptor nests would more appropriately be mapped on the Sensitive Species map. • There are only six raptor nests mapped for the entire Forest, which is unlikely. • No critical habitat is currently designated for Utah prairie dog. The mapped areas are likely current occupied habitat, which should not be mapped in a public document, per our comment above. • Greater sage-grouse was designated a candidate for federal listing on March 5, 2010, and should be mapped	Sensitive species locations are mapped and part of the documentation for this environmental analysis. The location of sensitive species and their habitat is public information, not protected, and is available to anyone who wants it. The sensitive species map includes species that are designated as sensitive by the Regional Forester of Forest Service Region 4. Wildlife maps contain known locations of species or habitat, and do not include all locations or habitat on the Forest. The term "critical habitat" has been changed for Utah prairie dog habitat to avoid confusion with designated critical habitat.

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	on the Threatened, Endangered, and Candidate Species Habitat map.	
	The scale and lack of detail in the document maps make it very difficult to determine the location of potential lease areas near the park [Capitol Reef].	All maps were redone and are contained in Chapter 2 and Appendix B of the FEIS.
	The Air Resources Division of the National Park Service (ARD) has reviewed the Air Quality Sections in chapter 3.12 of the Fishlake National Forest (FNF) Oil and Gas Leasing Draft Environmental Impact Statement (DEIS). Several key pieces of air quality information are missing from the DEIS materials provided, including the referenced Air Quality Modeling Report (Appendix D) and a cumulative effects analysis for air quality. As such, ARD cannot provide complete comments on the DEIS at this time. Consistent with the recently signed Oil and Gas Air Quality MOU, NPS requests that the USFS provide this information, along with additional time for public review and comment.	Appendix D addressing Air Quality and Appendix E addressing Climate change are and were available on the web and an additional comment period of 45 days was permitted. Cumulative Impacts of implementing the project to air resources along with past, present, and reasonably foreseeable projects are now discussed in Section 3.12.3 of the EIS.
	The NPS previously reviewed and commented on modeling reports prepared in support of the Dixie National Forest Oil and Gas Leasing EIS (JBR Environmental Consultants, Inc. January, 2010). This report addressed oil and gas leasing activity anticipated within the Dixie and Fishlake NFs. Based on the text in the FNF Oil and Gas Leasing DEIS, it appears the air quality section relies on results from this 2010 modeling study. The NPS ARD submitted comments on this modeling analysis to the Dixie NF in a letter dated March, 18, 2010. It appears that the FNF DEIS has incorporated some of these comments into the air quality analysis. For instance, page 167 of the DEIS states: "Based on this information, all proponents of exploratory projects within 5 km of a Class I area will be required to provide an	The air quality section has been revised and improved for the FEIS. Also, additional air quality modeling was completed for NOx and SOx. Air quality and greenhouse gas/climate change evaluations documented in the EIS reference and incorporate findings of JBR Environmental Consultants, Inc. January, 2010. Specific details of the models used and results of the modeling can be seen in Appendices D and E. As recommended by JBR, and reported in the EIS, the Fishlake will use modeling results to "screen" potential projects for acceptability with air quality standards. Refer to 3.12.3 Impacts Common to all alternatives for an example.

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	additional AQRV analysis prior to project approval." Likewise, page 171 states: "Also, any project [i.e. field development] that will meet or exceed the total project emissions assumed within this EIS will be compelled to complete an additional air quality analysis." These requirements are in line with comments provided by the NPS to the Dixie NF based on the Dixie and FNF modeling results. However, if the FNF analysis relied on this 2010 Air Quality Modeling Report, the discussion in the air quality sections of the DEIS lacks information regarding specific details of the analysis (i.e., air quality models used, etc.) and how that analysis is intended to be applied (i.e., as a screening tool). Per ARD comments sent to the Dixie NF in 2010, the NPS outlined specific criteria in which the existing modeling analysis could be used to "screen" a project proposal from further analysis. Additional explanation regarding the intended purpose of the screening analysis, as well as the rational for the future Class I AQRV analysis requirements should be included in the DEIS. This should be clarified to eliminate confusion in determining when additional air quality analyses should be completed, particularly for circumstances where the proposed development is between 5 and 60 km from a Class I National Park, and the level of development is greater than the "exploratory" scenario but less than the "field development" scenario.	
	Finally, NPS is pleased to see that the FNF included a Controlled Surface Use (CSU) Stipulation for the protection of Class I Airsheds. This type of stipulation will serve to protect air quality and air quality related values (AQRVs) in nearby Class I National Parks. However, per ARD comments provided to the Dixie NF in their March	The air quality section has been revised and improved for the FEIS.

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	2010 letter, they would like the opportunity to work with the USFS to make minor refinements to this language to fully address NPS concerns related to air quality.	
	The DEIS states, Section 1.9.2, that Cultural Resources are "Non-key Issues" and that, further, the EIS will not analyze the effects of the undertaking on them. Yet the document also states: "Cultural Resources Significant damage to cultural sites could occur as a result of oil and gas exploration and development. Section 106 of the National Historic Preservation Act of 1966, as amended, requires federal agencies to take into account any action that may adversely affect any site, structure, or object that is, or can be included in the National Register of Historic Places. These regulations, codified at 36 CFR 800, provide a basis for which to determine if a site is eligible for inclusion in the National Register of Historic Places. Prior to any ground disturbing activity associated with oil and gas development, the FNF will identify and evaluate, within the active lease areas, those Historic Properties that need to have mitigation undertaken. Under SLTs included in every lease, oil and gas facilities or activities may be moved by up to 200 meters (656 feet) to avoid impacts to those Historic Properties that warrant this. As a result, impacts to general cultural resources on the FNF would be avoided or mitigated at or prior to the construction phase."	Re: the statement "Significant damage to cultural sites could occur as a result of oil and gas exploration and development." This is not a statement of the Forest Service, rather an excerpt from a scoping comment letter. Some of the non-key issues section was rewritten to clarify why cultural resources were not identified as a key issue, and the statement above was removed.
	First, NPS does not agree with the assertion that cultural resources are non-key issues with regard to the provisions of the National Environmental Policy Act (NEPA). As the document states: "Significant damage to cultural sites could occur as a result of oil and gas exploration and development." The solution is to move facilities up to 200 meters away from historic properties	As stated in the previous response - Re: the statement "Significant damage to cultural sites could occur as a result of oil and gas exploration and development." This is not a statement of the Forest Service, rather an excerpt from a scoping comment letter. Some of the non-key issues section was rewritten to clarify why cultural

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	to avoid or mitigate "impacts to general cultural resources" whatever those might be. The Old Spanish National Historic Trail is not a "general cultural resource." It is centrally key to NPS's mission and represents a Congressionally-designated cultural resource of national significance. NPS does not believe that the DEIS adequately address direct, indirect, or cumulative adverse effects to trail segments and associated cultural resources, since it does not mention the trail. It does not address direct and cumulative adverse effects to trail settings and viewsheds. These are not mitigable by moving an oil and gas development a mere 200 meters, and, indeed, may not be mitigable at all. No monitoring provisions to ensure there are no adverse effects to trail resources are presented. NPS suggests that a non- development zone of five miles on either side of the Congressionally-designated Old Spanish National Historic Trail be established to protect trail segments, associated sites, and its viewshed. On page S-2, National Recreation Trails are excluded from surface occupancy, there is no mention of National Historic Trails, or other previously identified priority heritage assets in the INFRA database.	resources were not identified as a key issue, and the statement above was removed. The discussion of heritage resources, and why this is not a key issue has been expanded in the FEIS. This expanded section includes discussion of the OST. A complete discussion and analysis of heritage resources is included in the specialist report, contained in the project record. This report outlines the regulatory framework that we are required to operate under when dealing with heritage resources.
	Finally, NPS believes that the FEIS should analyze the serious direct, indirect, and cumulative adverse effects of oil and gas development to all cultural resources in the FEIS. The analysis of these effects should go into determining whether any action alternatives proposed under this DEIS should be approved. NEPA applies to all resources that may be adversely affected by a federal undertaking. They do not believe that the EIS adequately addresses the NEPA requirement to "take into account" these effects on cultural resources. NPS respectfully requests that the FNF prepare a supplemental DEIS with	The discussion of heritage resources, and why this is not a key issue has been expanded in the FEIS. This expanded section includes discussion of the OST. A complete discussion and analysis of heritage resources is included in the specialist report, contained in the project record. This report outlines the regulatory framework that we are required to operate under when dealing with heritage resources. As part of the Forest Service's response to comments on the DEIS, a NSO buffer was established around the Old Spanish Trail to address concerns expressed by commenters.

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	a complete analysis of the effects of this undertaking on natural and cultural resources, including the Old Spanish National Historic Trail. NPS would be happy to review the supplemental DEIS when it is done.	
	NPS is encouraged by the extent of a No Surface Occupancy designation for a majority of Fishlake National Forest land near and adjacent to the park under the agency preferred Alternative C. They believe that this can be effective in protecting many park resources. However, they are concerned about less restrictive designations at four locations along the park's [Capitol Reef] western boundary in the Fremont River Ranger District. The areas are remote and, for three of the areas, are roadless areas. They believe that surface occupancy of these lands could adversely affect park resources. From north to south, these areas are: 1) Near Jones Bench and Upper Cathedral Valley, designated Controlled Surface Use and Time Limitation. Park lands in this area are remote and include lands designated as proposed wilderness (Wilderness Recommendation, Capitol Reef National Park, 1974), and the park manages these lands as wilderness. There are no park roads in the vicinity, and there are no roads or trails on forest lands in the vicinity that are open to motorized travel. 2) Near Paradise Flats and Deep Creek, designated Controlled Surface Use and Time Limitation. Park lands in this area lie within a Primitive Zone. Park lands in this zone represent "the highest order of wilderness qualities, where isolated landscapes remain in an essentially wild and undeveloped condition. Terrain is rough, trails are few, and opportunities for solitude are abundant." (Capitol Reef National Park General Management Plan and Environmental Impact Statement, Record of Decision	In subsequent NEPA analysis, the Forest Service will look at specific places/effects when we know how and where there is a proposed well. Per earlier input from the Park and associated electronic view-shed analysis, restrictive stipulations have already been reasonably applied. Adding even more NSO at this time would be excessive at this point.

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	signed 2001). In addition, these lands are proposed as wilderness. No motorized or mechanized means of transportation are permitted on Park lands in this area. There are no roads or trails on forest lands in the vicinity that are open to motorized travel. 3) Near Buck Point and the South Draw Road, designated Lease Notice and Time Limitation. Park lands in this area are in a Primitive Zone and include lands designated as proposed as wilderness. The South Draw Road is a primitive 4X4 road typically traveled by visitors seeking a primitive, backcountry experience. The portion of the road on Forest land near the park is similarly primitive. 4) Near the Coleman Canyons and Dry Bench, designated Lease Notice and Time Limitation. Park lands in this area are in the Primitive Zone and include lands designated as proposed wilderness. There are no park roads in the vicinity, and there are no roads or trails on forest lands in the vicinity that are open to motorized travel. Further, motorized access to the area would require traversing lands managed by the Grand Staircase-Escalante National Monument, which has designated the route and lands in the area as closed to motorized travel.	
	The park coordinated with both the Fishlake National Forest and the Dixie National Forest (the latter previously managed some of the lands under consideration for development in this DEIS) during the development of their motorized travel plans. The final travel plans eliminated or modified motorized travel near the park in the areas listed above in order to assist the park in protecting park resources. That these areas are now proposed as open to surface occupancy and associated motorized travel adjacent to and near the park appears to be contrary to previous planning decisions.	The Forest Service is required to, and will ensure compliance with the motorized travel plan when conducting future NEPA analysis on submitted surface use plans of operation on any future leases.

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	All four of the areas above are adjacent to and visible from the park. Much of the viewshed in these lease areas show little evidence of human activity. Views to the outside of the park are integral to the views within the park, and together provide a pastoral panorama. Facilities constructed on these lease areas visible from the park would adversely impact visual resources. Capitol Reef National Park was designated Class I under the 1977 amendments to the Clean Air Act. Exploration and operation of oil and gas wells could affect the park's air quality, and potential lessees should be notified during the leasing process that appropriate mitigation requirements will be incorporated into operations to minimize adverse impacts.	Impacts to visual resources was analyzed and documented in the EIS. Impacts to air quality was also analyzed and documented and appropriate lease stipulations will be attached to any lease that would impact these resources. Site-specific analysis of potential impacts to these resources will be conducted if and when a SUPO is submitted to the Forest Service on any future leases.
	The lease lands in the Buck Point area could potentially be accessed via the South Draw Road, which passes through the park. The park's 2001 General Management Plan does not contemplate development of this road to a standard necessary for the commercial use associated with the potential lease of these lands. NPS recommends that it be stipulated that access to lease parcels will not be permissible via the portion of the South Draw Road which passes through the park. More broadly, for all parcels near the park boundary, leases that would create additional road access to the boundaries of the park can create avenues of inappropriate and unauthorized use by the public (e.g., off-road vehicle travel, poaching, wood gathering, etc.). It is important that access to the parcels not pass over park lands, and that any roads into the lease areas terminate prior to reaching the park boundary. Increased traffic loads near back-country recreational areas and on surrounding scenic byways could degrade the scenic value of the park and negatively	The Forest Service is required to, and will ensure compliance with the FNF motorized travel plan when conducting future NEPA analysis on approving submitted surface use plans of operation on any future leases. Mitigation measures and/or conditions of approval deemed necessary and appropriate can be developed and attached to approval of any future surface use plans of operation to protect surface resources as necessary.

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	affect visitor experience. This issue should be considered prior to entering lease agreements.	
	The ability to have a clear view of the night sky in the absence of artificial lighting is a valuable resource that is often overlooked. Capitol Reef National Park is fortunate to be located in some of the best areas in North America for night sky viewing. In order to preserve this, and the feeling of isolation provided by a nighttime view with large areas lacking in artificial light sources, NPS requests that a stipulation of no night lighting is incorporated in the lease terms and conditions within areas near the park. If lighting on some facilities is necessary for safety or by regulation, it should be shielded from view off site. Extensive night operations and gas flaring would seriously change the existing lightscape, and are unlikely to be effectively mitigated. The peaceful settings of the park provide the opportunity to experience natural quiet, which conveys a mood of solitude and enhances visitor experience. As development occurs near the park's boundary, there is an increased likelihood for natural soundscapes to be threatened. Excessive noise from oil and gas related traffic, drill rigs, and compressor stations could create an unacceptable impact on this important park resource.	This is true; however a restrictive stipulation concerning this is perhaps best dealt with in the permitting process. Not lighting towers has obvious safety issues that by law we may have no control over. Effects during exploration would be temporary-- if even of any measurable impact to the park. Again, in subsequent NEPA analysis… the Forest Service will look at specific places/effects when we know how and where there is a proposed well. Per earlier input, restrictive stipulations have already been reasonably applied. Adding even more NSO at this time would be excessive at this point.
	Mule deer, big horn sheep, Mexican spotted owls, and peregrine and prairie falcons are among the wildlife species potentially using the lease area. Although activities in the lease area may not have significant impacts on park wildlife, potential impacts could affect park wildlife management.	The Forest Service is required to analyze the impacts to wildlife within the analysis boundary of the proposed action. The Forest Service is not required, nor would it be appropriate, to analyze the impacts to NPS management policies or activities.
	Non-native vegetation should not be used in reclamation of disturbed lands. Only appropriate native species, as determined prior to development by the Forest Service in	Reclamation and revegetation guidelines will be established on a site specific basis in accordance with the Forest Service Native plants policy FSM 2070.3.

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	cooperation with the park, should be used in reclamation activities near the park. NPS recommends that areas proposed for leasing near the park include a rehabilitation stipulation. Standards and guidelines should be developed and required for revegetation and exotic weed control on leased areas adjacent to the park. The land in and around the park is relatively free of exotic weed species compared to many other areas throughout the state and country. Any ground disturbing activities leads to the increased probability of exotic weed invasions. While exotic weed invasion is more prevalent at lower elevations, it cannot be assumed that this will remain the case following post-leasing activities due to the type and extent of land disturbance involved.	
	Operations on leases which may drain into park watersheds should use appropriate containment systems to prevent runoff, e.g., containerized mud systems for drilling, berms, etc. Down-hole disposal of chemicals should be prohibited, and operators should submit emergency response plans that explicitly address accidental oil or chemical spills. The potential for watershed contamination and subsequent wildlife habitat degradation from spills and drilling muds is also a concern along the western boundary of the park.	These issues will be addressed when conducting future NEPA analysis on submitted surface use plans of operation at APD phase when we know where disturbance will be. The Forest Service and BLM are required to, and will be in compliance with Federal and State regulations, as well as other direction such as contained in the Gold Book.
	The potential lease areas lie within close proximity of park proposed wilderness. Oil and gas leasing and development have the potential to impact wilderness values and impact the experience of park visitors. The recommendations presented above under soundscape, night sky and viewshed would minimize impacts to wilderness values. Surface occupancy should not be permitted on lands adjacent to the park.	Impacts to these resources from oil and gas exploration and development will be analyzed and appropriately mitigated during the next stage of NEPA analysis, approval of a SUPO.
	Although the park is unaware of any archeological or	Impacts to these resources from oil and gas exploration and

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	historic sites on park lands adjacent to those parcels that are adjacent to the park, the potential exists for such sites to exist. Further, motorized travel associated with surface occupancy in areas adjacent to the park could increase access to what are now remote park areas, potentially impacting cultural resources. Consultation with the park's cultural resource staff should occur to assure that impacts to cultural resources within the park near these areas will not occur. Although much of the Fishlake National Forest land near to and adjacent to Capitol Reef National Park that is under consideration for oil and gas development is designated as No Surface Occupancy, some of these lands are designated for some form of surface occupancy. Because surface occupancy of these lands could adversely impact park resources, NPS recommends that forest lands in the four areas identified above be designated as No Surface Occupancy. As the Forest Service considers oil and gas leases near Capitol Reef National Park, NPS hopes that the concerns identified above will be examined, and the park looks forward to working with the Forest Service in addressing these concerns on a lease-specific basis should the Forest Service consider issuing permits for exploration or development on any Forest lands that may affect park resources. NPS appreciates the opportunity to review this document and thanks the FNF for considering their comments.	development will be analyzed and appropriately mitigated during the next stage of NEPA analysis, approval of a SUPO. The Forest Service will continue to involve NPS in future projects concerning the NPS.
	The document identifies numerous sensitive and endangered species (Mexican Spotted Owl, Bald Eagle, Peregrine Falcon, Flammulated Owls, Northern Goshawks, Greater Sage Grouse, etc.) that exist in the project area. Given the long-term time frame of these activities, the locations of sensitive and endangered	Surveys (generally 2 years) are required at the project level and will be conducted prior to any ground-disturbing action.

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	species nesting sites, and other habitat, could change over the project period. We suggest that the Final EIS include plans for a periodic monitoring program for sensitive and endangered species, and that the maps of the land available for leasing (see fig 2.2-3) be updated when species habitat usage changes.	
	Pg. 103: The document describes the habitat usage of the boreal toad to include beaver ponds. The location of beaver ponds can change over time, and may change in response to oil and gas development. We suggest that the Final EIS include a discussion of potential impacts to the beavers, beaver habitat, and to the associated impact to the boreal toad.	Beaver are classified as a furbearer and populations are managed by UDWR. A stipulation preventing surface occupancy within 300 feet of a wetland or riparian area should provide a large degree of protection for beaver habitat and thus boreal toad habitat on FNF.
	The document does not address the issues of streams and the major drainage basins that might be impacted by the proposed activities. There is no discussion of the number of potential stream crossings that may be required (based on the estimate of 52 miles of new road construction) or how those road crossings will be constructed to prevent alterations in sediment load or erosion of the stream banks. There is no discussion of the major groundwater bearing formations within the assessment area or their stratigraphic relation to the petroleum bearing formations. The hydrologic assessment presented is insufficient to support the page 141 conclusion of "minimal effects" on surface and groundwater. We suggest that the Final EIS include a discussion of the area surface-water resources, and possible impacts, and a discussion of the area hydrogeology and groundwater resources; specifically the potential for contamination of fresh-water resources.	We don't know if or where stream crossings would be constructed until a surface use plan of operation is submitted for approval. That is covered in a new site- specific analysis.
	Pg. 136 & 137: The document contains a discussion of buffer zones to protect surface water from the effects of	See the National Best Management Practices for Water Quality Management on National Forest Service Lands.

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	pad construction; however, there is no discussion of the potential impacts of road construction and stream crossings. We suggest the Final EIS include a discussion of road construction and mitigation practices, with particular emphasis on stream crossings and mitigation methods.	Volume 1: National Core BMP Technical Guide-FS-9990a-April 2012. http://www.fs.fed.us/biology/resources/pubs/watershed/FS_National_Core_BMPs_April2012.pdf. See Road BMPs Sections: Road-1 Travel Management Planning and Analysis, Road-2 Road Location and Design, Road-3 Road Construction and Reconstruction, Road-4 Road Operations and Maintenance, Road-5 Temporary Roads, Road-7 Stream Crossings, Road-9 Parking and Staging Areas, Road-10 Equipment Refueling and Servicing, Road-11 Road Storm-Damage Surveys would be a starting point for specific stream crossing construction and analysis and planning. This document discusses specific practices and mitigations for road and stream crossing construction that could be used when and if actual construction activities were to occur. The buffers would be for road construction too. The exception to the buffer is when a stream crossing(s) is absolutely necessary. See also the Hydraulic Considerations for pipelines Crossing stream Channels. Technical Note 423. USDI-BLM, April 2007. Pipelines that cross channels should be constructed to withstand floods of extreme magnitude, and either is high over or buried low enough to not be affected by floods if at all possible.
	Pg. 138: Paragraph 2 states that without detailed information, the sediment load impacts could be “negligible to major”, however, paragraph 3 states that these same impacts will be negligible, and paragraph 4 states that these impacts will be negligible to minor. The absence of supporting information makes it impossible to narrow the impacts. We suggest the Final EIS maintain the language of “negligible to major” when referring to	The hydrologist does imply that with proper mitigation or BMPs that effects would likely be minimized and thus the difference between the two statements. The hydrologist also suggests that most O&G activities will be on slopes less than twenty percent, and that at a watershed scale that some effects would be dissipated in a watershed, and that because of these factors that effects would likely decrease down to minor because of these reasons. The hydrologist

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	sediment load impact.	tried to show that at a local site scale then impacts could be from barely noticeable up to major, but that a watershed scale then effects would not likely be as impactful to the water and watershed values as much. Hence the difference in descriptions. Both are correct depending on the associated analysis and the basis for the descriptions and if normal operations occur or if something like an accidental spill were to occur for example. The EIS should be better distinguishing better between the differences. Please see the hydrologist report.
	Pg. 140: Paragraph 1 states "The potential for connected actions related to oil and gas leasing to affect surface water flow and ground water availability was described above. That potential was determined to be negligible for both surface water and groundwater, and would be virtually the same for all action alternatives." However, the document does not provide specific surface water or groundwater information and therefore it is not possible to confirm the determination of negligible effects. We suggest the Final EIS provide the rational and analysis used for the determination of negligible.	The current analysis is done at the Forest Scale. It would be impossible to address specific impacts on literally every stream on the Forest. Thus effects must be described generally. If this analysis was completed for a specific action in a specific location then impacts could better be described for both time and space. That site-specific analysis is required for permitting. The determination is that in general having just the RFDS to work with and a general description of the activities that are most likely to occur, the impacts are described as what might be the impacts for a stream, lake, pond, etc. Given the NSO buffers to perennial streams, lakes, or ponds, volatile soils, slopes over 35%, the use of BMPs and Standard Lease Terms and Conditions in areas with no other limitations or exclusions then given the protections in place then there would not likely be impacts to ground or surface water sources and hence the determination of negligible to minor.
	Pg. 140: Paragraph 2 states that "Contamination from a producing well is unlikely as they are steel-cased to the hydrocarbon (oil production) zone. The same situation exists for an injection well. DOGM requirements for steel casing on both types of well are required by State law."	The Forest Service does not have any specific APD proposals at this time. The analysis requested would be applied at the APD stage. See 550-IM No. UT 2010-055 - Protection of Ground Water Associated with Oil and Gas Leasing, Exploration and Development - Utah

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	However, the document does not provide information on the drilling and grouting methods that will be used to prevent cross contamination of the water bearing units. We suggest the Final EIS include a discussion of the drilling and grouting methods and methodologies to insure that cross contamination does not occur.	BLM.doc (July 20, 2010) and the associated attachments. http://www.blm.gov/ut/st/en/prog/energy/oil_and_gas/ground_water_protection.html The document above describes the necessary review and analysis of APD and the process to protect groundwater and gives additional sources that show additional input with the State of Utah. It should be noted that site specific analysis will need to occur later, but that the process is in place to protect ground water resources. The document described above with the associated attachments describes the protection regulation and guidance, analysis and documentation process, geologic and hydrologic APD review, and the APD evaluation, as well as notifications regarding drinking water protection and sole source aquifers needed at the site specific level rather than at the forest wide or programmatic scale that the leasing FEIS addresses.
	Pg. 140: Paragraph 3 states "It is not in the well producer's interest to lose fracturing chemicals and water into freshwater aquifers, with hydrocarbon zones well below freshwater aquifers. Therefore the opportunity to inject these chemicals is minimized to an extremely low possibility by BMP's and economics." We agree that the loss of chemicals into freshwater aquifers is not in the producer's interest; however, the scientific literature is full of unintended environmental consequences. We suggest the Final EIS include a discussion of the procedures and methods used to prevent groundwater contamination. This relates to the earlier comment about the lack of hydrologic information on the water bearing formations, confining units, and the stratigraphic separation between freshwater bearing	The Forest Service does not have any specific APD proposals at this time. The analysis requested would be applied at the APD stage. See **550-IM No. UT 2010-055 - Protection of Ground Water Associated with Oil and Gas Leasing, Exploration and Development - Utah BLM.doc (**July 20, 2010) and the associated attachments. http://www.blm.gov/ut/st/en/prog/energy/oil_and_gas/ground_water_protection.html This document describes the necessary review and analysis of APD and the process to protect groundwater and gives additional sources that show additional input with the State of Utah. It should be noted that site specific analysis will need to occur later, but that the process is in place to protect ground water resources. The document described

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	formations and hydrocarbon resources. Information on the area geohydrology would allow reviewers to assess the likelihood that current BMPs are suitable to protect groundwater resources.	above with the associated attachments describes the protection regulation and guidance, analysis and documentation process, geologic and hydrologic APD review, and the APD evaluation, as well as notifications regarding drinking water protection and sole source aquifers (none on or in the vicinity of the Forest) needed at the site specific level rather than at the forest wide or programmatic scale that the FEIS document addresses. The APD process is in place to address cross contamination prevention.
3 - State of Utah – Division of Drinking Water and Division of Wildlife Resources commented	The Division of Drinking Water would encourage the USFS to avoid permitting leases or drilling in Drinking Water Source Protection zones.	See **550-IM No. UT 2010-055 - Protection of Ground Water Associated with Oil and Gas Leasing, Exploration and Development - Utah BLM.doc (**July 20, 2010) and the associated attachments. http://www.blm.gov/ut/st/en/prog/energy/oil_and_gas/ground_water_protection.html This document describes the necessary review and analysis of APD and the process to protect groundwater and gives additional sources that show additional input with the State of Utah. It should be noted that site specific analysis will need to occur later, but that the process is in place to protect ground water resources. The document described above with the associated attachments describes the protection regulation and guidance, analysis and documentation process, geologic and hydrologic APD review, and the APD evaluation, as well as notifications regarding drinking water protection and sole source aquifers needed at the site specific level rather than at the forest wide or programmatic scale that the FEIS document addresses.
	The Timing Limitation for big game wintering areas should be from December 1 – April 15 in crucial winter range. The Timing Limitation for greater sage grouse	The TL for big game wintering areas was changed in the FEIS to December 1 – April 15 to maintain consistency with recommendations made by UDWR.

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	brood-rearing habitat should be May 1 – August 15.	The TL for sage-grouse brood-rearing habitat was changed from May 1 – July 15 to May 1 – August 15 to maintain consistency with recommendations made by UDWR.
	As road density is planned to increase from this proposed project, fragmentation should be appropriately addressed in Alternative C.	A general discussion on the effects of fragmentation is included in section 3.5.2 (General Effects to Wildlife). More detailed analysis will be made on a project basis when details of the location, pattern and extent of development become available.
	UDWR recommends the inclusion of Utah species of concern.	Comment addressed in response to USFWS (above).
	UDWR recommends using U.S. Fish and Wildlife Service's Guidelines for Raptor Protection.	Prior to any surface disturbing action a survey for nesting raptors is required. If active nests are found, procedures outlined in UTAH FIELD OFFICE GUIDELINES FOR RAPTOR PROTECTION FROM HUMAN AND LAND USE DISTURBANCES (USFWS 1999) will be followed.
	DEIS states that pygmy rabbits have not been observed within the Fillmore and Richfield Ranger Districts, however, on page 98 it states that there is a colony on the Richfield ranger District. As UDWR has no records of pygmy rabbits on either the Fillmore or Richfield Ranger Districts, we recommend verification of the colony observation.	The FEIS includes pygmy rabbit in the Richfield district. Pygmy rabbit distribution is based on data summarized in Rodriguez (2005) as well as personal communication with district biologists.
	Southern leatherside is a conservation agreement species and the USFS is a signatory to the agreement. Potential impacts to the southern leatherside should be included in the DEIS. Impacts to southern leatherside from oil and gas activity are likely to occur from increased sedimentation, erosion, toxic inputs, loss of habitat, the spread of aquatic invasive species, and dewatering. Timing restrictions for southern leatherside spawning may be appropriate for April 1 – June 30. Also, Bonneville and Colorado River cutthroat trout have	Southern leatherside information has been added to the EIS, including noting that a Conservation Agreement has been completed, which the Forest Service is a signatory to. Southern leatherside is also a R4 Forest Service sensitive species and additional information is located in the Wildlife and Fisheries specialist report for the EIS. They have a relatively limited distribution on the Fishlake N.F. Language has been added to the EIS noting that Bonneville and Colorado River cutthroat trout have Conservation Agreements which include the Forest Service as a signatory.

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	agreements which include the US Forest Service as a signatory. These conservation agreements should be noted in the DEIS.	
	Ingestion of trash by California condors often caused death from impaction of the crop. The DEIS states that increases to mortality would be negligible to the California condor. As there are approximately 70 individuals of this species in Utah, any increases in mortality could impact the population.	This was deleted from the wildlife specialist report and the FEIS.
	Protection measures for Utah prairie dog should extend to future planned habitats for translocation or reintroduction. Please contact UDWR for a list and map of these areas.	Adam Kavalunas (UDWR) was contacted and a request was made for a list and map of these areas.
	DEIS states that bald eagles are not as vulnerable during non-breeding times. Bald eagles are typically a winter resident in the Fishlake nation Forest and important winter roost sites should be identified and avoided if possible.	Bald eagle winter concentration areas on the FNF are referenced in section 3.5.3.2. BE winter concentration areas would be NSO under Alt C (section 2.2.3) and Alt D (2.2.4). Under alternative B moderate, long-term impacts could occur to BEWCA's. Text was added to bald eagle analysis to clarify effects of proposed actions on winter concentration areas for all action alternatives.
	The DEIS provides only a brief analysis of bats. Most of the focus is on disturbance to roosting habitat. A significant impact may be the creation of unsafe foraging areas and open ponds associated with oil and gas activities. There are several protection measures that have proven effective for bats. These include using closed containment systems, keeping oil off open water, and using wildlife deterrents such as netting over ponds. In addition, night lighting should be used in human activity areas only, lights should be downward-directed, and guy wires should be eliminated where possible.	Specific mitigation measures will be addressed at the project level, in future site-specific NEPA.
	The DEIS states little information exists for sage grouse on the FNF. UDWR has several years of lek count data	The most recent data collected from leks on or adjacent to the FNF was obtained from UDWR and included in the

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	and the Parker Mountain Adaptive Resource Management Local Working Group, Brigham Young University, and Utah State University have gathered an incredible amount of grouse information that could be used to determine population trends in the region. UDWR recommends including these data and subsequent trend analysis in this section for appropriate impact analysis. In addition, the DEIS reports 163,512 acres of sage grouse habitat on the FNF and references UDWR 208 data. UDWR records actually indicate over 180,000 acres of sage grouse habitat including over 170,000 acres of brood-rearing habitat on the FNF.	Wildlife Specialist Report. Acreage used in the analysis was calculated by taking the UDWR coverage and removing non-sagebrush cover types not used by sage-grouse (i.e. mixed conifer) located inside the UDWR habitat polygon. This resulted in a total that was less than the original UDWR estimate. While the resulting data is arguably more accurate, to address this comment and limit confusion UDWR data (which includes non-sagebrush habitat) was used for the analysis included in the FEIS.
	It should be noted UDWR is actively managing the Thousand Lake Mountain region in the Fremont River Ranger District for an objective of zero bighorn sheep.	UDWR is responsible for managing BHS populations and the FNF fully supports UDWR in fulfilling this charge. Bighorn sheep have been documented using habitat on the eastern border of FNF near the boundary with Capitol Reef National Park. Since UDWR has very little control over wildlife population on national parks, it is assumed that this use will continue. Because BHS have R4 sensitive status and have a long term (>10 years) and well documented history in this area an analysis was required. The BHS analysis included in the specialist report and DEIS briefly mention current UDWR policy regarding the Thousand Lake Mountain region to provide context, but population management or political considerations are outside the scope of this
	Noise and disturbance from construction activity can also decrease breeding potential in sagebrush nesters by making it more difficult for males to establish territories and attract mates. Studies have shown that increase well density results in significant decreases in numbers of sagebrush obligate sparrows (Gilbert and Chalfoun, 2011, Journal of Wildlife management. 75:816-824). This study should be noted in this section.	The study by Gilbert and Chalfoun was considered while analyzing effects to sage-brush nesters, but was not included in the leasing DEIS because the anticipated well density across all sage-nester habitat on the FNF (0.03 wells/km^2) was far below the levels used in the study (up to 30 wells/km^2). However, the results of this study should be considered at the project level to assess the impacts of well density on a more localized area.

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	The following statement is not necessarily true at a localized level: "There would be some loss of foraging habitat due to direct loss and disturbance, but there would be no effect on migratory bird populations because this type of habitat is abundant and birds are mobile and readily use alternate foraging sites." There could be localized congregations of migratory birds in specific habitats that are not abundant (e.g. riparian areas, wet meadows, aspen). Migratory bird foraging habitat is not always abundant, especially in Utah.	Because the actual location and extent of potential future development is unknown the leasing DEIS addresses forest-wide impacts. Based upon the projected level of development habitat loss would be minor at this scale. Localized impacts will be addressed at the project level. Also, under alternatives A, C and D O&G development in most specific habitats (riparian areas, wet meadows) would not occur. Under even the least protective alternative (B), direct habitat loss in aspen types could be about 1% of this type forest-wide, if all anticipated O&G activities (1,421 acres) were to occur in aspen or mixed conifer-aspen habitat.
	In the Cumulative Effects section, it should be disclosed that overall trends for sagebrush nesting MIS are decreasing. Data from the USFS monitoring of sagebrush MIS should be presented in the DEIS.	Based on BBS survey data (http://www.mbr-pwrc.usgs.gov/bbs/bbs2010.html), over the past 10 years two of the three MIS species show positive trends in Utah (Brewers, 6.1 and Sage Thrasher, 1.3) with the other species having a slightly negative or stable trend (Vespers sparrow -0.5). This information was added to the FEIS.
	The overall trends for MIS species should be included for all species.	Trend data using in analysis can be accessed at http://www.mbrwrc.usgs.gov/bbs/bbs2010.html
	UDWR requests that off-site mitigation, in the form of habitat restoration, be considered for projects that have direct impacts to important wildlife habitats. This mitigation could take the form of direct habitat enhancement. The Utah Partners for Conservation Development have identified high-priority areas in need of restoration in key habitats across the state, including FNF.	Additional mitigation, including off-site habitat restoration, may be considered at the project level to off-set deer and elk habitat lost to actions associated with oil and gas development. This type of mitigation is not appropriate to consider at this programmatic level of analysis when we don't know when or where ground-disturbing activities might take place.
4 - Andrew Taft	Expressed concern with interactions between bighorn sheep and domestic sheep flocks. Expressed opinion that identified bighorn sheep habitat is not suitable because UDWR is removing bighorn sheep from the Fremont Ranger District.	The purpose of this document is to analyze the potential effects of oil and gas development on wildlife species using the FNF. As an R4 sensitive species, bighorn sheep and bighorn sheep habitat must be included. UDWR management of BHS and management of livestock grazing

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		are outside the scope of this analysis. All habitat used in species analysis are based on the best scientific information (models) available supplemented with UDWR distribution data, and reliable observations. Thousand Lake Mountain is included as potential habitat as it was naturally colonized by BHS that persisted and increased for years and it is connected to occupied habitat on Capitol Reef NP and thus likely to see at least occasional future use. Since the life of this document is long (20+ years) and population management objectives often change it is both appropriate and prudent to analyze potential impacts to habitat regardless of current policy. Further, having an area identified as habitat does not preclude population management actions for particular species (i.e. UDWR has actively removed big game from public and private lands located inside “critical” and “high value” habitat in order to address depredation issues).
5 - Wayne County	Expressed same concerns as Mr. Taft about interactions between bighorn sheep and domestic sheep. They request that the Forest Service revise the DEIS to reflect the decision by UDWR to remove bighorn sheep from the Fremont River District, and that the Forest Service revise the bighorn sheep habitat map to show no potential habitat on the Fremont River ranger District.	See above response to Mr. Taft’s comment.
6 - EPA	There is insufficient mitigation to protect air quality. To more clearly define the level of protection afforded by "appropriate Best Available Control Technology" to be implemented through the CSU stipulation to protect Class I airsheds, we strongly recommend that the Final EIS include a minimum set of emissions control requirements. We recommend that the language from the Dixie National Forest Final EIS "Oil and Gas Construction and Operating Standards and Well Site	A Controlled Surface Use Stipulation (Refer to Table A-2 of Appendix 5.0) with no exceptions, modifications or waivers would be required for Class I Airsheds. Dixie National Forest "Oil and Gas Construction and Operating Standards and Well Site Design Requirements" regarding air quality have been added to those required for the Fishlake N.F.

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	Design Requirements" regarding air quality protection be added to the Construction and Operation Standards for the Fishlake National Forest, and incorporated into the Fishlake Lease Notice, and that these additions appear in the Final EIS. This language would specify when additional project specific air impact analyses would need to be conducted in the future. It would also establish mitigation requirements including engine standards for internal combustion engines used in drilling and production operations as well as dust control requirements.	
	As a general matter, it is important that the Forest Service ensure that mitigation requirements are consistent with the air modeling conducted. For example, non-road well pump engines should be required to meet or exceed Tier II emissions limits for particulate matter and Tier III emissions limits for NOx and CO, as this is what was modeled.	Compliance with "Oil and Gas Construction and Operating Standards and Well Site Design Requirements" would be ensured.
	The air quality modeling performed for the Dixie and Fishlake National Forests does not address the 1- hour N02 and 1-hour SO2 National Ambient Air Quality Standards (NAAQS), which were promulgated after the Forest Service, completed the modeling. Because the EPA finalized the 1-hour N02 and 1-hour S02 NAAQS in April and August of 2010, respectively, these standards are applicable to the project and we recommend that compliance with the standards be analyzed in the Final EIS.	The DEIS has been amended to address predicted 1- hour N02 and 1-hour SO2 concentration levels. Information for the amendment was obtained by modeling and specific results of this effort can be seen In Appendix D – SIR-1C.
	The air quality modeling analysis completed by the Forest Service in February 2010 assumed the use of drilling rig engine emissions based on a Tier II engine standard. Consequently, the use of Tier II engines should be required as a minimum emission control to ensure that	Engine use requirements are now shown in the amended FNF Oil and Gas Construction and Operating Standards and Well Site Design Requirements.

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	project impacts do not exceed those predicted in the screening analysis. However, if modeling of the 1-hour N02 NAAQS is not completed, we suggest requiring lower emitting Tier IV drill rigs (or their equivalent), which have more often shown compliance with the 1-hour N02 NAAQS in modeling we have reviewed for other air quality analyses.	
	The potential impacts to ozone concentrations from leasing and development of oil and gas resources on the Fishlake National Forest were not analyzed in the modeling analysis. The Draft EIS indicates that, due to the small emissions levels of ozone precursors and the regional nature of the pollutant, ozone impacts will be addressed under cumulative effects. However, the Draft EIS does not include an air quality cumulative effects section. An assessment of the potential cumulative impacts of a proposed action in combination with other past, present, and reasonably foreseeable future development is a critical piece of disclosure through the NEPA process for any project. A disclosure of cumulative air quality impacts should therefore be added to the Final EIS.	Cumulative Impacts of implementing the project to air resources along with past, present, and reasonably foreseeable projects are now presented in the Air Quality Section of the EIS. As explained on page 1 of Appendix D – SIR-1 ozone is not discussed in CEA. However, effects of implementing the proposal on greenhouse gases are disclosed in Appendix E.
	Although ozone has not been identified as a concern in the project area, emissions from oil and gas development have contributed to ozone issues in other fields in the western United States. It is therefore important that this NEPA analysis address the potential ozone impacts of the proposed action.	Ozone is not discussed in depth in the EA or appendices. The rationale for this is explained on page 1 of Appendix D – SIR-1. Ozone was not identified as something needing discussion in meeting and conference calls with the EPA. In fact when asked about PSD increments for ozone Molly V said that they have not been established and that “these are not typically discussed in AQ reports.”
	Since the level of oil and gas exploration and development that may ultimately occur on leased lands within the Fishlake National Forest is not conclusively known, we recommend that the Final EIS include a	As explained on page 1 of Appendix D – SIR-1, a region-wide cooperative approach is appropriate to assess impacts of secondary pollutant precursor emissions. The FS will cooperate with UDAQ and the Utah Governor’s Office when

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	commitment that the Forest Service will require future ozone analysis if oil and gas activity exceeds that projected in this "EIS analysis, similar to the commitment in the Dixie' Final EIS. We recommend that this requirement be included in a lease notice to alert future lessees of the potential need for ozone modeling.	such an assessment is undertaken.
	The Draft EIS does not present key information necessary to understand the potential impacts to air quality from oil and gas leasing and development on the Fishlake National Forest. We recommend adding a table showing the relevant NAAQS for comparison to the modeling results presented in Section 3.12.2. Further, we recommend including information on cumulative air impacts such as current monitoring information for air quality and air quality related values (AQRVs), criteria pollutant emissions, and existing emission sources in or near the Fishlake National Forest.	Reference is now made to a table displaying NAAQ standards available at http://www.epa.gov/air/criteria.html. Cumulative Impacts of implementing the project to air resources along with past, present, and reasonably foreseeable projects are now presented in the Air Quality Section of the EIS.
	According to the Draft EIS, groundwater in the Forest has not been well characterized. However, understanding the quality of groundwater resources present in the project area is critical to understanding the potential for impacts. We recommend that the Final EIS disclose additional information characterizing the Forest's groundwater resources, including: Maps of the aquifers in the project area including formation names and depths; identification of existing and potential underground sources of drinking; the location and extent of the groundwater recharge areas; and identification of shallow and sensitive aquifers that are susceptible to contamination from surface activities.	The soils and hydrologist reports cite the general hydrogeology map, the locations of hydric soils, the 303(d) listed and TMDL completed water bodies (includes maps of water sampling or Storett locations). Well sites with basic information such as location and water depth can be found at the USGS-Groundwater Watch-Utah Active Water Level Network website. See Beaver, Juab, Millard, Piute, Sevier, and Wayne Counties. http://groundwaterwatch.usgs.gov/GoogleMaps/UT_gm.html
	We recommend that the Final EIS provide additional information in table and mapped forms on: Designated DWSPZs for groundwater or surface water resources;	There are 3,815 water rights that within the Forest or for domestic uses are on or within ~1 mile of the Forest Boundary. There are 267 water rights for domestic uses

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	water rights for public water systems; domestic or stock watering wells, springs, or surface water intakes; and Municipal Watersheds designated within the Forest.	that are on or within ~1 mile of the Forest boundary (including FS administration, recreation residences such as those at Fishlake and Merchant Valley, and campgrounds), 24 for irrigation, 1, 212 for stock watering (important and very common use on the Forest), and 2,312 for other uses (most of these are stock watering too). Many of the domestic water rights include inholdings within the Forest, or are for communities or residences below the Forest boundary. There are no Municipal Watersheds designated within the Forest. See Water rights Map in Hydrologist Report.
	The EPA recommends that the analysis of potential impacts to surface water be expanded to allow a broader consideration of the potential consequences of a leasing decision, since development authorized by the leasing decision could include development beyond the 73 wells currently predicted.	The Fishlake derived the Reasonable Foreseeable Development Scenario based on the real likelihood of development and generally where it is likely occur. It also looked at how development has occurred at areas such as the Providence and Covenant Fields. The size of the disturbance, the number of test wells, the number of active wells, etc. The RFDS was set up to give us a realistic projection of what development is predicted. This was the scenario approved for analysis by Forest Leadership to more narrowly define what to expect for impacts based on the most probable scenario. All resources, including surface water/ hydrology used this scenario for analysis.
	The EPA is particularly concerned with the potential for water quality impacts to impaired water bodies, including water bodies listed on the Clean Water Act§ 303(d) list and water bodies with completed Total Maximum Daily Loads (TMDLs). If oil and gas development occurs on the Fishlake National Forest, it will constitute a new nonpoint source that may result in further impairment and the potential for additional violations of surface water quality standards and the Clean Water Act if additional pollutant loads reach these impacted water bodies. We therefore	Additional information was added to the FEIS to satisfy this request.

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	request that the Forest Service explain in the Final EIS how oil and gas exploration and development may impact lakes and reservoirs with completed TMDLs and/or listed water quality impairments, for the specific pollutants listed.	
	Although there are no state-designated surface water protection zones currently within the Fishlake National Forest, such zones may be designated in the future. We suggest that the Forest Service consider expanding the NSO stipulation for DWSPZs to include surface water zones in case such zones are designated during the life of this planning document. The EPA also generally recommends NSO in Municipal Watersheds.	Without knowing if or where a surface water protection zone might be designated in the future, it is impossible to know where to apply a NSO stipulation now. The Forest Service believes it is inappropriate and ineffective to apply such speculative land management practices.
	The Preferred Alternative includes an NSO stipulation for a 300-foot buffer around all perennial streams, reservoirs, springs and lakes, while Alternative D provides a 500-foot NSO buffer for these resources. While we recognize that the Preferred Alternative also includes an NSO restriction for slopes greater than 35%, which will help to prevent impacts associated with storm water runoff, we believe that a valuable environmental benefit is gained by increasing the NSO buffer to 500 feet.	Both 300- and 500-feet are common buffers for Oil and Gas type activities. See the University of Colorado Law School-Natural Resource Law Center-Intermountain Oil and Gas BMP Project (http://www.oilandgasbmps.org/index.php). Specifically BMPs number 7518, 3247, 108, 3283, 3290, 3307, 7384, 152, 3604, 565, 5449 and 1205 for 300-foot (a couple 330') buffers; and BMPs number 2829, 4, 55, 1709, 154, 1451, and 108 for 500 foot buffers. These examples do not have any slope cutoffs that, again, in our case would aid in protection given the 300-foot buffer in the preferred alternative example. There is an alternative with a 500-foot buffer that is analyzed as well in Alternative D. The analysis is used as a means of comparison among the alternatives. The hydrologist did not try and show that one alternative is better or more valuable than the other but analyzed what the impacts of the various alternatives would be. It is therefore logical to say that 500-foot buffers could be better than 300-foot buffers in theory, but given the slope cutoffs there may not be the need for the extra 200 feet of buffering for these activities in reality. That is what the

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		hydrology analysis shows by using the buffer table from the Forest Plan with appropriate buffers by slope breaks (FLRMP, p. IV-43). This table in the Forest Plan shows that 280 feet would be appropriate for up to 40% slopes. The slope break of 35% that is proposed in this project would be covered by actually less than 280 feet, but goes up to 300 for added protection. See also the hydrology report pages 21, and 26-28.
	EPA requests that the Final EIS clarify whether construction of linear facilities (i.e., roads, pipelines, etc.) may still occur in this NSO area, and recommend avoidance of this area.	Construction of roads, pipelines, and other similar facilities must comply with direction in the Fishlake and or Dixie National Forest Land and Resource Management Plans.
	EPA recommends that the NSO stipulation, a 500 foot buffer zone, and avoidance of linear facilities construction be applied to protect all wetlands, regardless of their jurisdictional status.	All of these concerns are addressed by the development of Alternative D. Alternative D is a fully developed and analyzed alternative. The differences between, and the impacts of all alternatives are compared and summarized in Chapter 2. All of the fully developed and analyzed alternatives are available for the responsible official to select.
	Executive Order 11988 Floodplain Management calls on Agencies to avoid to the extent possible the long and short term impacts associated with the occupancy and modification of floodplains and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative. The EPA recommends an NSO stipulation be added for floodplains.	The Fishlake National Forest maintains compliance with Executive Order 11988 in relationship to floodplain management. In general, on the Forest most floodplains would be within the 300-foot (Preferred Alternative) and 500-foot buffers (Alternative D) because of the mountain and canyon systems and thus they would be NSO. Most bank-full channels and floodplains on the Forest are only a few feet to up to about 20 feet wide or so. So 300 or 500 feet on either side (total of 600 or 1,000 feet) would actually cover those distances more amply enough by a multiple of factors of safety. The Fishlake National Forest does not have large rivers like those found elsewhere. There are only 2 “small rivers” on Forest-Fremont and Beaver Rivers.

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		The Forest Plan states that special protection and management will be given to floodplains, wetlands and all land and vegetation for a minimum of 100 feet from the edges of all perennial streams, lakes and other water bodies of water or to the outer margin of the riparian ecosystem if wider than 100 feet (FLRMP, P. IV-33). Again the buffer distances would be a few times larger than the floodplain distances and would be more protective than the 100-feet buffer required in the Forest Plan for floodplain protection to avoid impacts to floodplains and most cases would already be NSO by default. See also page 13 of the hydrology report.
	The EPA suggests that the Forest Service provide more specificity about BMPs to protect water resources by including additional information in the Final EIS on the types of BMPs the Forest Service plans to implement, including the circumstances under which the BMPs would be applied.	Additional information is included in the FEIS water resources section to address this request.
	We recommend that the Final EIS include a commitment that future project-level NEPA analyses for oil and gas development will contain a monitoring plan and program to track groundwater and surface water impacts as drilling and production operations occur. In the absence of groundwater modeling to determine the distance from the project at which impacts may occur, the EPA recommends the Forest Service adopt a requirement for monitoring to occur in private wells within one mile of an oil and/or gas project area.	The Forest appreciates the concern for maintaining useable water and it is a high priority of the Forest Service. The Forest will look at needs for monitoring at the exploration and/ or development stage. At the time the Forest receives a Surface Use Plan of Operation, the Forest Service will take a hard look at the locations of water, wells, and the potential to impact those resources. If the Forest concludes the need for such monitoring then it will be addressed at that time and written into the appropriate NEPA document.
	According to the Draft EIS, the majority of groundwater basins in the Forest are fully or almost fully appropriated and drawdown of groundwater levels is a potential concern in the project area. The EPA recommends reuse	The Forest appreciates the concern for maintaining useable water and it is a high priority of the Forest. Service. The Forest will look at needs for water used and produced for O&G production when a Surface Use Plan to Operate is

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	of produced water for these activities to reduce the use of drinking water resources and help ensure the long term sustainability of these operations. Further, because availability of freshwater could be a concern for future oil and gas development projects in the Forest, we recommend that the Final EIS specify that future multiple-well oil and gas projects will need a water resource management plan to address water consumption and produced water disposal, including identifying water recycling opportunities.	received. That decision or requirement would be applicable at the site specific project NEPA level.
7 – UEC and Others	The DEIS does not sufficiently consider any of our scoping comments. It does not consider the input from our 2011 scoping period in the development of significant and/or key issues that either must be analyzed in detail and/or used to drive development of action alternatives. One of the outcomes resulting from this is that the range of alternatives is inadequate because conflicts among alternative uses of available resources remain that are not addressed in the action alternatives analyzed.	The Forest Service fully addressed UEC's updated "SMU" alternative and incorporated the elements of the updated "SMU" alternative into Alternative D, which was developed wholly on the recommendations contained in UEC's submitted comments. Upon receipt of UEC's updated "SMU" alternative during the second scoping period, the Forest Service carefully compared the original scoping comments submitted in 2006 with the updated comments submitted in 2011, and changed Alternative D accordingly. There are two documents contained in the administrative record illustrating how these comparisons were made, and the results.
	Of specific concern to UEC and partners is the protection of Class I airsheds and unroaded, undeveloped areas.	Class I airsheds and unroaded, undeveloped areas are both adequately addressed in the development of the alternatives, as well as fully analyzed and documented in the DEIS.
	Inventoried Unroaded Undeveloped Area (UUA) impacts are identified in DEIS Chapter 1.9 as a significant issue. The actual environmental analysis that follows in the DEIS fails to disclose or take NEPA's hard look at the real and potential impacts to the potential Wilderness area attributes for inventoried UUA. Based on the fundamentally speculative a non-site-specific nature of	The Forest Service addressed this as a key issue in the DEIS and effects are analyzed, documented and compared between alternatives in Chapters 2 and 3. We agree that the Reasonably Foreseeable Development Scenario is non- site-specific. Again, particularly in relation to meaningfully describing any effects to Unroaded and Undeveloped character for a given area -- during subsequent NEPA

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	the Reasonably Foreseeable Development Scenario, DEIS Chapter 3.6.2 arbitrarily dismisses serious analysis of impacts as some type of speculative endeavor.	analysis, the Forest Service will look at specific places/effects when it is known how and where there is a proposed well. Per earlier input, restrictive stipulations have already been reasonably applied. Adding even more NSO at this time would be excessive at this point.
	The UEC and partners state that the Roadless Area Conservation Rule is stale and inaccurate, and needs to be updated. They believe that the action alternatives need to be re-evaluated for impacts to IRAs.	Updating the RACR has nothing to do with this analysis. The Forest Service believes the alternatives adequately address IRAs. Three of the four alternatives place all IRAs under either No Lease or NSO.
	UEC and partners believe the Forest Service should add analysis that considers the potential effects of the RACR's definition of IRA. Specifically, the UEC and partners are concerned that the DEIS treats IRAs as "geospatially static" and does not consider the possibility of revisions to the IRAs on the Fishlake National Forest. They suggest the FEIS should include a (Lease Notice for example) that would allow future IRAs to "enjoy the RACR's full protections/prohibitions even if not "officially" IRA at the time of this EIS (and upcoming ROD)".	The Forest Service is and will still be required to maintain compliance with all federal laws and regulations, including the RACR if it is still in effect in the future, when authorizing activities in the future. The Forest Service will ensure compliance with all applicable laws when conducting future site-specific analysis on SUPOs submitted in the future.
	The UEC and partners feel there should be an action alternative developed and analyzed that studies a NSO stipulation for all IRAs and UUA areas.	The FNF has no policy or regulation for the protection of UUAs. Three of the 4 alternatives have all IRAs under either NL or NSO stipulation. The Forest Service feels this adequately addresses the issue.
	On Legislation Within Scope; Northern Rockies Ecosystem Protection Act EIS Chapter 1.7 concludes with an assessment of pending Congressional legislation. It appears irrelevant, on first tale. For example, its focus on the potential effects/implications of the Wilderness, Wild and Scenic Rivers and other Congressional designations in the Northern Rockies Ecosystem Protection Act (NREPA) on this Fishlake N.F. oil/gas leasing EIS lead the reviewer to confusion, and to question the relevancy of the 'hard look' afforded to this project in South-Central Utah, as	This is a very confusing comment, and hard to determine what it means, or what exactly the concern is. The Forest Service is unable to respond without clarification.

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	opposed to another oil/gas leasing EIS covering a Northern Rockies National Forest in R1.	
	Action alternatives B through D would each require a Forest Plan amendment. DEIS, S-6. However, just stating that LRMPs would need to be amended for each action alternative is not sufficient under NFMA or NEPA. The subsequent environmental analysis in the DEIS must instead explicitly list all direction, changed geospatially mapped LRMP Management Prescriptions and corresponding plan components must be removed and/or added to the Fishlake and Dixie LRMPs under each action alternative. This appears systematically overlooked.	The ROD has the Forest Plan amendments attached as appendixes A and B, fully identifying all management direction and mapping that the amendments change. It's not possible to attach the amendments at the Draft EIS stage because a decision has not yet been made as to which alternative will be selected.
	UEC and partners state "In the DEIS, the Forest Service Does Not Meet its NEPA Obligations Relative to Water and Watershed Resources". They feel that "in several important ways, the Forest Service has failed in its legal obligations relative to water and watershed resources in issuing the DEIS".	It's difficult to decipher what exactly is meant by "NEPA Obligations Relative to Water and Watershed Resources" and "legal obligations relative to water and watershed resources." Water and watershed resources have been at the forefront from the beginning of this analysis. Water and watershed resources have been addressed in the development of the alternatives, and impacts have been analyzed and documented in the DEIS, Section 3.9, pages 130 – 145, and in the FEIS. The Forest has prepared a Hydrology and Soils Report regarding water and watershed resources. In addition the Fisheries issues have been addressed in the Wildlife report. Watershed Specialists have been involved in the NEPA process on this project for approximately 6 years. This includes meeting attendance multiple times a year, coordination with the BLM and State of Utah, discussions about potential alternatives, development of the RFDS. Water and watershed analysis in specialist reports address water use, surface and ground water quality, soils, riparian areas, floodplains, wetlands, drinking water source protection zones and potential

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		impacts to these very important resources. The Forest has met the legal requirements regarding NFMA, NEPA, and the Clean Water Act regarding water and watershed values and uses the best available science in doing so.
	The UEC and partners feel the DEIS fails to ensure compliance with Utah Water Quality Standards. They state that the DEIS does not ensure that oil and gas development on the Forest will be compliant with the Clean Water Act, or that existing high water quality in all Forest waters will be maintained. They believe the water quality analysis is inadequate and fails to take a hard look at impacts.	The Forest has been actively working with the State of Utah in sampling water quality across the Forest. Since 2002 we have sampled streams in the Fremont River Basin, Salina Creek Basin, Clear Creek Basin, Beaver River Basin, Otter Creek Basin, and many tributaries within the Lower and Middle Sevier River Basins. In the last decade the Forest has sampled 5 or more sites a year to systematically assess water quality across the Forest. The Forest and State Division of Water Quality have sampled lakes and streams across the forest over that same period of time. The Forest collects macro-invertebrate samples within fish bearing streams. Within the next few years the Forest will have completed sampling, and will start a new cycle. Within the last 2-years the Forest has purchased pathogens sampling equipment that we have allowed the BLM and Sevier River Water Users group to use to begin assessing pathogens on the Forest. This equipment is the only equipment of its kind in central Utah. The Forest is actively engaged and is a leader in water quality monitoring and assessments on the Forest to maintain the high quality waters of the Forest and Clean Water Act compliance and will continue to do in regards to Oil and Gas activities within the Forest. The Forest has monitored and assessed water quality cooperatively with the State of Utah to maintain compliance with the Clean Water Act, and will continue to do so in regards to new oil and gas development. The Forest is actively engaged in improving and restoring watersheds. The Forest will follow the procedures required outlined in the EIS to protect water quality.

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	The UEC and partners are concerned that the Forest Service does not "undertake a systematic assessment of water quality based on actual monitoring".	See previous comment and response.
	The UEC and partners state "In this DEIS, the Forest Service has not met its obligations under either NEPA or the National Historic Preservation Act (NHPA) because the agency has failed to determine the direct, indirect and cumulative impacts of the proposed action and its alternatives on cultural resources". They feel that there will "almost certainly" be significant damage to cultural sites regardless of protection measures in all alternatives that would result in avoidance of the resource during exploration or development activities.	The Oil and Gas EIS is a programmatic document. When specific proposals are submitted by the proponents then NEPA will engage. This engagement activates the Section 106 process (NHPA). As of this date, we have received no specific request for projects or undertakings.
	The UEC and partners state "In the DEIS, the Forest Service does not adequately address the Reform Act requirements". They feel the Forest Service has not acknowledged the agency's "additional legal obligations prior to authorizing leasing, including a determination that, where surface occupancy is allowed, development is possible somewhere on the lease".	The Forest Service assumes that the "Reform Act" which UEC and Partners refer to is the Federal Onshore Oil and Gas Leasing Reform Act (FOOGLRA). This act allows the FS to include required resource protection stipulations in leases authorized by the BLM. In this EIS the FS has identified stipulations that will protect resources regardless of where they are located on the surface of the lease.
	The UEC and partners are concerned that the "proposed lease stipulation is inadequate". They believe that it does not guarantee that impacts to cultural resources on the FNF would be avoided or mitigated at, or prior to the construction phase. They feel the stipulation does not require adequate surveys be conducted prior to ground disturbing activities.	We are compelled to follow the Section 106 process. We are required to survey for heritage resources, commensurate with the level of potential impact of a project, record heritage properties, make determinations or significance and effect, and consult with the USHPO. If adverse effects are anticipated, an MOA is constructed and signed by the proponent, agency, pertinent Native American tribes and the USHPO. Mitigation is then initiated by a qualified contractor.
	The UEC and partners state "Moreover, while the DEIS states that oil and gas facilities or activities may be moved by up to 200 meters (656 feet) to avoid impacts to . . . Historic Properties, no such notice is provided in the lease stipulations. What is more, given other restrictions imposed by stipulation – such as requirements to avoid steep slopes and riparian areas – there is no assurance	The issuance of a lease requires that the proponent comply with existing laws and regulations. If an undertaking threatens heritage resources, an archaeological contractor will complete the Section 106 process which includes review by the USHPO. And if the effects of a project are determined to be adverse, and other resource values are comprised by the avoidance of a heritage resource, then an

Commenter	Comment	Response
	that cultural sites can be avoided without compromising other protected resource values. As a result, not only is the lease stipulation inadequate, but so is the NEPA analysis that relies on it.	MOA is constructed, with the above-mentioned parties, and data recovery is conducted by a qualified consultant.
	The UEC and partners feel that the Forest Service has failed to adequately address visual resources and tourism. They believe that since part of the FNF is adjacent to Capitol Reef National Park, and travel corridors the people that visit these landscapes could be negatively impacted. They believe the agency has failed to determine how tourism and visitor experience will be affected, and makes no attempt to determine cumulative impacts of the proposed action on the Park or the visitor experience there.	Visitors in general, for which the potential visual effects of leasing have been described, are considered to commonly be tourists. More specific impacts will again be more meaningfully dealt with in subsequent NEPA analysis. Effects to “tourism” itself would be better dealt with in the Social/Economic section.
	The UEC and partners state that the DEIS fails to analyze ozone, and the impact oil and gas activities could have on ozone pollution, particulate matter and the impact oil and gas activities could have to the $PM_{25,}$ PSD increments, and impacts on NAAQS on PM_{25} and PM_{10}.	Ozone is not discussed in depth in the EA or appendices. The rationale for this is explained on page 1 of Appendix D – SIR-1. Ozone was not identified by EPA as something requiring discussion. Effects of the proposal on NAAQS, PM25 and PM10 are disclosed in Appendix D & E.
	The UEC and partners believe the Forest Service has failed to analyze and assess the impacts of the 1-hour nitrogen dioxide NAAQS, and impacts to sulfur dioxide NAAQS.	The DEIS has been amended to address predicted 1- hour N02 and 1-hour SO2 concentration levels. Information for the amendment was obtained by modeling and specific results of this effort can be seen In Appendix D – SIR-1C.
	The UEC and partners feel that the Forest Service has not given consideration to alternatives that reasonably address air quality impacts of oil and gas development; specifically they feel the Forest Service did not adequately analyze the alternative submitted by UEC during scoping.	The air quality section was re-done for the FEIS and more thoroughly addresses air quality impacts. Additional air quality modeling was completed to address NOx and SOx. Alternative D was developed specifically to include the components and elements requested by UEC, and the organizations they partner with (comment letters are available for review in the administrative record).
	The UEC and partners feel the Forest Service fails to demonstrate compliance with substantive air quality	The Forest Service analyzed and documented the effects of the proposal on air quality and will comply with all laws

Commenter	Comment	Response
	duties, and that deferring to State regulation of air quality is not adequate.	rules and regulations.
	The UEC and partners request that the SMU alternative submitted by UEC be “properly addressed and analyzed in detail”.	Alternative D was developed entirely on the content of the “SMU” alternative submitted by the UEC and partners during the two scoping periods. A more detailed explanation of how the Forest Service considered both scoping comment submissions of the “SMU” alternative is addressed in the FEIS at pages 25 and 32-34
8 – Utah Wool Growers	Expressed the same concern as Wayne County and asked for the DEIS and maps to be revised for bighorn sheep in the same way.	See above response to Mr. Taft’s comment.
9 – State of Utah, Division of Oil, Gas & Mining	Concerned that oil and gas exploration, development and production on “as much as 79 percent” of land administered by the Forest will be restricted by no surface occupancy stipulations thus precluding potential economic benefits. Also concerned that requests for facilities on NFS land that are related to oil and gas activities not located thereon will require “years of environmental analysis.	Concern noted. Restrictions required by regulations related to Inventoried Roadless Areas are outside the scope of this EIS. Concern noted. Requirements of National Environmental Policy are outside of the scope of this EIS
10 – State of Utah, Public Lands Policy – John Harja	Concerned that FNF will restrict oil and gas activities within 4 miles of an active lek rather than 3 miles which is recommended by the recently developed State sage-grouse management plan.	Concern noted. Rationale for use of the 4 mile buffer is explained in the ROD on page 10.

APPENDIX H

Fishlake National Forest Land and Resource Management Plan

(Forest Plan)

Amendment Number 17

LRMP page IV-37

Remove the following from "GENERAL DIRECTION" for Minerals Management Leasables on page IV-37 of the LRMP:

1. Leasing, permitting, or licensing of National Forest System lands will be based on site specific considerations using appropriate standards and guidelines for the management unit concerned. Criteria for these actions should minimize impacts on, or conflicts with, other resource uses and should return disturbed lands to planned surface resources or uses.

Replace it with the following:

1. Leasing, permitting, or licensing of National Forest System lands for leasables other than oil and gas will be based on site specific considerations using appropriate standards and guidelines for the management unit concerned. Criteria for these actions should minimize impacts on, or conflicts with, other resource uses and should return disturbed lands to planned surface resources or uses.

LRMP page IV-37

Remove the following paragraphs from "GENERAL DIRECTION" for General Direction 1 for Minerals Management Leasables on page IV-37 of the LRMP:

A. Forest Service authorization of geophysical prospecting will include terms and conditions (see stipulation in Appendix H) controlling operating methods and times to prevent or control adverse impacts on surface resources and uses.
B. Recommendations of consent to BLM for issuance of leases and permits will include all current standard stipulations and the regionally approved special stipulations that may be necessary for additional protection of specific surface resources and uses. These standard and current regionally approved special stipulations are in Appendix H to the Forest Plan.

Replace them with the following:

A. Forest Service authorization of geophysical prospecting will include terms and conditions (see stipulation in Appendix H(a)) controlling operating methods and times to prevent or control adverse impacts on surface resources and uses.
B. Recommendations of consent to BLM for issuance of leases and permits, other than oil and gas, will include all current standard stipulations and the regionally approved special stipulations that may be necessary for additional protection of specific surface resources and uses. These standard and current regionally approved special stipulations are in Appendix H(a) to the Forest Plan.

LRMP page IV-37

Remove the following from" STANDARDS AND GUIDELINES" for General Management 1 of Minerals Management Leasables on page IV-37 of the LRMP:

a. All leasable and salable minerals:

Activities may be denied or limited where the current uses or activities exceed, or the proposed activities may result in exceeding the standards outlined in the stipulations provided in Appendix H.

Replace with the following:

a. All leasable, other than oil and gas, and saleable minerals:

Activities may be denied or limited where the current uses or activities exceed, or the proposed activities may result in exceeding the standards outlined in the stipulations provided in Appendix H(a).

LRMP page IV-37

Remove the following from "STANDARDS AND GUIDELINES" for General Management 1 of Minerals Management Leasables on page IV-37 of the LRMP:

b. Oil and gas, geothermal, coal and CO2 activities may be limited where:

Replace it with the following:

b. Geothermal, coal and CO2 activities may be limited where:

LRMP page IV-38

Insert under "GENERAL DIRECTION" after General Direction 1 (A-C) of Minerals Management Leasables on page IV-38 of the LRMP

2. Forest Service recommendations of consent to BLM for issuance of oil and gas leases and permits will include all current stipulations for oil and gas leasing in Appendix H(b).

LRMP page IV-38

Insert under "STANDARDS & GUIDELINES" for General Direction 2 of Minerals Management Leasables on page IV-38 of the LRMP

a. All oil and gas minerals:

Activities may be denied or limited where the current uses or activities exceed, or the proposed activities may result in exceeding the standards outlined in the stipulations provided in Appendix H(b).

<u>LRMP Appendix H:</u>

Remove the following title of Appendix H, page H-1 of the LRMP

Appendix H

STIPULATIONS FOR MINERAL ACTIVITES

Replace it with the following:

Appendix H(a)

STIPULATIONS FOR MINERAL ACTIVITIES OTHER THAN OIL AND GAS LEASING

<u>LRMP Appendix H:</u>

Remove the following from bullet 1(A) of paragraph 1 of Appendix H on page H-1, LRMP

A. Oil and Gas Leases

Replace with the following:

A. Leasables

<u>LRMP Appendix H:</u>

Insert the following immediately after page H-7.

Procedure for Leasing

Oil and Gas Leasing Matrix

Stipulation Forms

Lease Notices

Appendix H(b)

for Oil and Gas Leasing on Lands Administered by the Fishlake National Forest

PROCEDURE FOR LEASING

The following leasing matrix provides the appropriate lease stipulations and lease notices that would be attached to each lease for each resource area administered by the Fishlake National Forest. Approximately 1,707,810 acres of National Forest System lands are administratively available for oil and gas leasing. Of the 1,707,810 acres administratively available 253,299 are within the boundaries of the Dixie National Forest (The Teasdale District) which is administered by the Fishlake National Forest. These leasing procedures are to be followed for National Forest System lands administered by the Fishlake. Oil and gas leases offered will include Standard Lease Terms and other applicable stipulations identified as necessary for resource protection. Lease stipulations serve to mitigate potential effects of Federal oil and gas activities. The lessee must accept these stipulations as conditions of purchasing the lease. These stipulations represent Forest Service decisions regarding the best means of avoiding or minimizing environmental impacts that may arise from the project while meeting the integrated resource management requirements of the Forest Plan. They are incorporated into the lease as an official attachment to the standard form. Potential lessees are made aware of stipulations prior to any lease sale. These stipulations include No Surface Occupancy (NSO), Timing Limitations (TL), and Controlled Surface Use (CSU). Lease Notices (LN) would be utilized to notify potential lessees of specific conditions or restrictions already in place by law or regulation. Fishlake National Forest Oil and Gas Construction and Operating Standards and Well Site Design Requirements provides a listing of regulations and guidance to future operations (Appendix F, Fishlake National Forest Oil and Gas Leasing Environmental Impact Statement).

Oil and Gas Leasing does not approve any ground disturbing activities. If lands are leased and the lessee proposes an Application Permit to Drill (APD) agencies would consider approval of ground disturbing activities. Approval of ground disturbing activities would require separate NEPA analysis and a separate decision for each proposal. Should issues or resources be identified at those times that warrant additional protection, the Forest Service can take full advantage of provisions included in the lease and prudent use of a provision in the Standard Lease Terms and Conditions (SLT&C) applicable in all leases that allows the surface management agency to require movement of proposed facilities up to 200 meters to avoid negatively affecting resources. The Standard Lease Terms and Conditions can be found in Bureau of Land Management for 3109-3 – Stipulations for Lands Under Jurisdiction of Department of Agriculture and Forest Service (Intermountain Region) Supplement A to form 3109-3 – Surface Disturbance Stipulation.

Exceptions, modifications, or waivers to the lease stipulations may be granted if oil and gas operations could be conducted without causing unacceptable impacts. Exceptions, modifications, or waivers must be consistent with the approved Forest Plan and all applicable regulatory provisions. If the Forest Supervisor determines that the waiver, exception, or modification involves an issue of major public concern, the waiver, exception, or modification would be subject to a 30 to 90 -day public review period (36 CFR § 219.8).

Oil and Gas Leasing Matrix

Lands Administered by the Fishlake National Forest

Leasing Stipulations by Resource Area

Resource Area	Stipulation
Watershed resources	
Geologic hazards/unstable soils	NSO-01
Steep slopes >35 percent	NSO-02
Riparian areas	NSO-03
Delineated Wetlands	NSO-04
Perennial Streams, Reservoirs, Springs, and Lakes	NSO-05
Drinking Water Source Protection Zone	NSO-06
Wildlife and Plant Species	
T,E,S Plants	NSO-07
Aquatic Fauna	NSO-08
Greater Sage Grouse Leks	NSO-09
Pygmy Rabbit Colonies	NSO-10
Bald Eagle Winter Concentration Areas	NSO-11
Mexican spotted owl PACs	NSO-12
Goshawk core nest areas	NSO-13
Goshawk PFAs	CSU-01
Active raptor nest areas	CSU-02
Bighorn Sheep Lambing Areas, Crucial Elk Calving and Mule Deer	TL-01
Crucial Elk and Mule Deer Winter Range	TL-02
Bighorn Sheep Winter Range	TL-03
Greater Sage Grouse Brood-rearing Habitat	TL-04
Greater Sage Grouse Winter Habitat	TL-05
Visual resources	
High Scenic Integrity areas	NSO-14
Inventoried Roadless Areas	
Inventoried Roadless Areas	NSO-15
Recreation	
Developed Recreation Sites and National Recreation Trails	NSO-16
Other Resources	
Research Natural Areas	NSO-17
Forest Service Administrative Sites and Facilities	NSO-18
Cultural Resources, Old Spanish Trail, Paradise Valley, Quitchupah Canyon	NSO-19
Air Quality	CSU-03

NO SURFACE OCCUPANCY STIPULATION – 01
Watershed Resources: Geologic hazards/unstable soils

No Surface Occupancy for Geologic Hazards and Unstable Soils

Where: Within areas delineated and mapped by the Forest Service as containing geologic hazards and/or unstable soils.

For the Purpose Of: Protecting soil resources, because soils disturbed by construction and drilling activities on steep slopes would be difficult to reclaim. No well sites or production facilities may be constructed in these areas.

Exceptions: If after an environmental analysis the Forest Service authorized officer determines roads or other temp facilities may cross geologic hazards after a plan would be submitted by the operator and approved prior to construction and maintenance and include:

- An erosion control strategy
- A detailed slope stability analysis and plan for maintaining a stable slope
- A detailed restoration/reclamation plan
- Proper survey and design (with construction plans and drawings) by a certified engineer

Modification: A modification may be granted if an on-the-ground inspection of a proposed well site or facility shows an area of less than 35% slope exists and mass wasting - prone soils do not exist or that design of the site can mitigate erosion, failure, and reclamation concerns.
Waiver: None

NO SURFACE OCCUPANCY STIPULATION – 02
Watershed Resources: Steep Slopes > 35%

No Surface Occupancy on Steep Slopes

Where: Within areas delineated and mapped by the Forest Service having slopes greater than 35 percent, and high erosion potential areas in north horn sediments with slopes greater than 25 percent.

For the Purpose Of: Protecting soil resources, because soils disturbed by construction and drilling activities on steep slopes would be difficult to reclaim.

Exception: If, after an environmental analysis, the Forest Supervisor determines (1) there are no other practical placement alternatives, and (2) impacts could be fully mitigated, surface occupancy in the NSO area may be authorized. Additionally, a plan would be submitted by the operator and approved prior to construction and maintenance and include:

- An erosion control strategy,
- A detailed restoration/reclamation plan, and
- Proper survey and design (with construction plans and drawings) by a certified engineer.

Modification: None

Waiver: None

NSO – 02

NO SURFACE OCCUPANCY STIPULATION – 03
Watershed Resources: Riparian Areas

No Surface Occupancy for Riparian Areas

Where: Within 300 feet of Forest Service delineated boundary of riparian areas.

For the Purpose Of: Protecting riparian ecosystems. Riparian ecosystems are managed by the Forest Service to protect from conflicting uses in order to provide healthy, self-perpetuating plant and water communities that will have optimum diversity and density of understory and overstory vegetation. No well sites or production facilities will be allowed, and oil and gas exploration and development will be moved outside of the riparian vegetation area. Construction of roads, pipelines, and other similar facilities must comply with direction in the 1986 Fishlake National Forest Land and Resource Management Plan.

Exceptions: An exception could be authorized if: (a) an on-site review determines the area proposed to be impacted is not riparian; and (b) any additional mitigation that is determined to be necessary is fully implemented.

Modification: None

Waiver: None

NSO – 03

NO SURFACE OCCUPANCY STIPULATION – 04
Watershed Resources: Delineated Wetlands

No Surface Occupancy for Delineated Wetlands

Where: Within 300 feet of delineated and mapped boundary of jurisdictional wetlands.

For the Purpose Of: Protecting jurisdictional wetlands relative to Executive Order 11990, and the associated habitats, water quality, and ecosystems associated with these areas. In order to protect these areas no well sites or production facilities may be constructed in these areas, and oil and gas exploration and development will be moved out of wetlands. Construction of roads, pipelines, and other facilities must comply with direction in the 1986 Fishlake National Forest Land and Resource Management Plan.

Exceptions: An exception could be authorized if: (a) an on-site review determines the area proposed to be impacted is not a jurisdictional wetland; and (b) any additional mitigation that is determined to be necessary is fully implemented.

Modification: None

Waiver: None

NO SURFACE OCCUPANCY STIPULATION – 05
Watershed Resources: Perennial Streams, Reservoirs, Springs, and Lakes

No Surface Occupancy for Perennial Streams, Reservoirs, Springs, and Lakes

Where: Within 300 feet of all perennial streams, reservoirs, springs and lakes.

For the Purpose Of: Protection of water quality in surface water resources.

Exceptions: None

Modification: None

Waiver: None

NSO – 05

NO SURFACE OCCUPANCY STIPULATION – 06
Watershed Resources: Drinking Water Source Protection Zones

No Surface Occupancy for Drinking Water Source Protection Zones (Protection Zones 1 – 3, and T2 and T4)

Where: Within the delineated boundary of DWSPZs.

For the Purpose Of: Protecting public drinking water sources in municipal and transient water protection zones.

Exception: An exception may be granted for road construction if it is determined by site-specific analysis that: building the road in a water source protection zone has the least impact on the environment; roads already exist in the area; and the local municipality approves.

Modification: None

Waiver: None

NSO – 06

NO SURFACE OCCUPANCY STIPULATION – 07
Wildlife and Plant Species: Threatened, Endangered, Proposed and Sensitive Plants

No Surface Occupancy for TEP Plant Locations and Sensitive Plant Conservation Agreement Areas

Where: Areas within one mile of known federally Threatened, Endangered or Proposed plant locations, and areas within one mile of Sensitive plant locations covered under a conservation agreement.

For the purpose of: Protecting and conserving federally Threatened, Endangered, Proposed, and Sensitive plant populations.

Exceptions: An exception may be granted if through site specific study, and in cooperation with the US Fish and Wildlife Service, an area is determined to not be providing suitable habitat for any federally Threatened, Endangered, Proposed or Sensitive plants.

Modification: None

Waiver: None

NO SURFACE OCCUPANCY STIPULATION – 08
Wildlife and Plant Species: Aquatic Fauna

No Surface Occupancy in Key Habitats for Boreal Toad

Where: Within key boreal toad habitat delineated and mapped by the Forest Service.

For the purpose of: Protecting key habitat and known locations of boreal toad.

Exceptions: None

Modifications: None

Waivers: None

NO SURFACE OCCUPANCY STIPULATION – 09
Wildlife and Plant Species: Greater Sage Grouse Leks

No Surface Occupancy in Sage Grouse Leks

Where: Within 4 miles of sage grouse leks delineated and mapped by the Forest Service.

For the purpose of: Protecting breeding and brood-rearing sage grouse from predation, habitat fragmentation, and disturbance.

Exceptions: An exception may be granted if the Forest Supervisor, in coordination with the Utah Division of Wildlife Resources, determines through analysis that the nature of the actions, as proposed or conditioned, could be fully mitigated. This might occur if topography and/or vegetation are present that would effectively screen the structure or facility from the breeding habitat.

Modifications: None

Waivers: None

NO SURFACE OCCUPANCY STIPULATION – 10
Wildlife and Plant Species: Pygmy Rabbit Colonies

No Surface Occupancy in Known Pygmy Rabbit Colonies

Where: Within pygmy rabbit colonies delineated and mapped by the Forest Service.

For the purpose of: Protecting known populations of pygmy rabbits and their habitat.

Exceptions: None

Modifications: None

Waivers: None

NSO – 10

NO SURFACE OCCUPANCY STIPULATION – 11
Wildlife and Plant Species: Bald Eagle Winter Concentration Areas

No Surface Occupancy in Bald Eagle Winter Concentration Areas

Where: Within bald eagle winter concentration areas delineated and mapped by the Forest Service.

For the purpose of: Protecting bald eagles in their wintering habitat.

Exceptions: An exemption may be granted if it is determined through site-specific analysis that the area is not suitable habitat.

Modifications: None

Waivers: None

NO SURFACE OCCUPANCY STIPULATION – 12
Wildlife and Plant Species: Mexican Spotted Owl PACs

No Surface Occupancy in Mexican Spotted Owl Protected Activity Centers (PACs)

Where: Within delineated and mapped Mexican spotted owl PACs**.**

For the purpose of: Protecting habitat areas for Mexican spotted owl that are not fully protected by the Endangered Species Act, which include all non-Critical Habitat areas.

Exceptions: None

Modifications: None

Waivers: None

NSO – 12

NO SURFACE OCCUPANCY STIPULATION – 13
Wildlife and Plant Species: Goshawk Core Nest Areas

No Surface Occupancy in Goshawk Core Nesting Areas

Where: Areas delineated by the Forest Service as core nesting areas for northern goshawk. Known goshawk nest areas are confidential and are not shown on any maps in the EIS.

For the purpose of: Maintaining the integrity of nesting habitat structure and the character of the surrounding habitat within a territory.

Exception: None

Modification: None

Waiver: The Authorized Officer may grant a waiver if conditions have changed such that there is no reasonable likelihood that the lease area can support further nesting activity. A waiver to the above lease stipulation may be requested along with the submission of a Surface Use Plan of Operations (36 CFR 228.104).

Any Changes to this stipulation will be made in accordance with the Forest Plan and/or the regulatory provisions for such changes (For guidance on the use of this stipulation, see BLM Manual 1624 and 3101 or FS Manual 1950 and 2820).

NSO – 13

NO SURFACE OCCUPANCY STIPULATION – 14
Visual Resources: High Scenic Integrity Areas

No Surface Occupancy for Areas with High Scenic Integrity

Where: Frequently viewed areas of high scenic integrity

For the Purpose Of: Preserving and maintaining High Scenery Integrity Objectives where there are primary important travel routes or use areas where users have a major concern for the aesthetics of the viewed landscape.

Exception: Based on site specific review, an exception may be granted if the effects of the proposed activity will not cause the area to fall below a high scenic integrity objective.

Modification: None

Waiver: None

NSO – 14

NO SURFACE OCCUPANCY STIPULATION – 15
Inventoried Roadless Areas: Inventoried Roadless Areas

No Surface Occupancy in Inventoried Roadless Areas

Where: Within the boundary of all Inventoried Roadless Areas.

For the Purpose Of: Protecting the roadless and wilderness characteristics of these lands. No well sites or production facilities will be allowed on these lands. Construction of roads, pipelines, or other facilities must comply with direction in the Forest Plan.

Exception: None

Modification: None

Waiver: None

NSO – 15

NO SURFACE OCCUPANCY STIPULATION – 16
Recreation: Developed Recreation Sites and National Recreation Trails

No Surface Occupancy for Developed Recreation Areas and National Recreation Trails

Where: Within ¼ mile of developed recreation sites and national recreation trails.

For the Purpose Of: Protecting the capital investment and recreation uses associated with these sites. Construction of roads, pipelines, and other facilities must comply with direction in the Forest Plan.

Exception: None

Modification: A modification may be granted if a portion of the developed recreation sites in the leasehold are moved or eliminated.

Waiver: A waiver may be granted if all the developed recreation site(s) in the leasehold are moved or eliminated.

NSO – 16

NO SURFACE OCCUPANCY STIPULATION – 17
Other Resources: Research Natural Areas

No Surface Occupancy in Research Natural Areas

Where: Within the boundary of all Research Natural Areas.

For the Purpose Of: Protecting the characteristics, function, and intended use of these lands.

Exception: None

Modification: None

Waiver: None

NSO – 17

NO SURFACE OCCUPANCY STIPULATION – 18
Other Resources: Forest Service Administrative Sites and Facilities

No Surface Occupancy for Administrative Sites

Where: Within ¼ mile of Forest Service administrative sites.

For the Purpose Of: Protecting the capital investment and uses associated with administrative sites. Construction of roads, pipelines, and other facilities must comply with direction in the Forest Plan.

Exception: None

Modification: A modification may be granted if a portion of the administrative site(s) in the leasehold are moved or eliminated.

Waiver: A waiver may be granted if all the administrative site(s) in the leasehold are moved or eliminated.

NSO – 18

NO SURFACE OCCUPANCY STIPULATION – 19
Other Resources: Cultural Resources; Old Spanish Trail, Paradise Valley, Quitchupah Canyon

No Surface Occupancy in Old Spanish Trail Corridor

Where: Within the boundary of the Old Spanish Trail corridor delineated and mapped by the Forest Service.

For the Purpose Of: Protecting the integrity of the trail and the viewshed along the corridor.

Exception: None

Modification: None

Waiver: None

No Surface Occupancy in Paradise Valley Cultural Resource Site

Where: Within the boundary containing a high density of recorded cultural resource sites in Paradise Valley, delineated and mapped by the Forest Service.

For the Purpose Of: Protecting the cultural resources in this area containing an unusually high density of recorded sites.

Exception: None

Modification: None

Waiver: None

No Surface Occupancy in Quitchupah Canyon Cultural Area

Where: Within the boundary of Quitchupah Canyon Cultural Area.

For the Purpose Of: Protecting the cultural use and values of these lands.

Exception: None

Modification: None

Waiver: None

CONTROLLED SURFACE USE STIPULATION – 01
Wildlife and Plant Species: Goshawk PFAs

Controlled Surface Use in Goshawk Post Fledgling Areas (PFA)

Where: Within goshawk PFAs delineated and mapped by the Forest Service.

For the purpose of: Providing for goshawk fledgling survivorship by maintaining solitude and ambient noise levels during the fledgling period within the PFA.

Surface occupancy or use is subject to the following special operating constraints:

Prior to any surface disturbing activity in a goshawk PFA, a two-year protocol survey would be required and would need to be completed between March 1 and September 30. If any occupied or active nests are found within the PFA, high intensity oil and gas activities such as construction and drilling will be restricted in the area of the PFA from 1 March to 30 September or until birds have fledged as determined by Forest Service wildlife staff.

Exception: None

Modification: None

Waiver: None

CSU – 01

CONTROLLED SURFACE USE STIPULATION – 02
Wildlife and Plant Species: Active Raptor Nests

Controlled Surface Use for Active Raptor Nests

Where: Within the influence zone of affected raptor species as determined by guidelines set forth by the US Fish and Wildlife Service.

For the purpose of: Protecting nesting raptors and their young.

Surface occupancy or use is subject to the following special operating constraints:

Raptor nest surveys are required in potentially suitable habitats for all raptors, including Threatened, Endangered, Sensitive and MIS species prior to the approval of surface disturbing activities at a specific location.

If active or occupied raptor nests are located, high intensity activities such as construction and drilling will be restricted surrounding the nest(s) within an influence zone. Influence zones and duration of restrictions would depend on the raptor species of concern as determined in the guidelines set forth by the US Fish and Wildlife Service for Utah species. Influence zones are line-of-sight to specified distances. If topography or vegetation provides adequate screening needed to maintain nest viability, the distance may be reduced (to be determined by the Fishlake National Forest wildlife biologist).

For the purpose of: Protecting nesting raptors by maintaining solitude and ambient noise levels during the nesting season.

To provide protections to golden eagles beyond the Bald and Golden Eagle Protection Act by avoiding injury or mortality to nestlings and adults (take) through spatial and seasonal buffers.

Exception: None

Modification: None

Waiver: None

CONTROLLED SURFACE USE STIPULATION – 03
Other Resources: Air Quality

Controlled Surface Use for Class I Airsheds

Where: For exploratory projects on all lands within 5 km of Class I airsheds and for development and production projects on all lands in within 60 km of Class I airsheds.

For the purpose of: Protection of air resources in and around Class I areas to meet or exceed FLAG guidelines.

On all lands in within 60 km of Class I airsheds, surface occupancy or use is subject to the following special operating constraints:

Proposed operations must be located and/or designed to not cause or contribute to adverse impacts to air quality related values in Class I airsheds. Operators will be expected to use appropriate Best Available Control Technology (BACT) to reduce impacts to air quality and air quality related values by reducing emissions from field production and operations. The future development of the lease parcels may be subject to appropriate mitigation and conditions of approval (COAs) to reduce or mitigate air resource impacts and GHG emissions.

To ensure this, within 5 km for exploratory projects and within 60km for development and production projects of any Class I airshed an air impact analysis would be required prior to any field activity to demonstrate that proposed operations and associated mitigating measures will not result in an exceedances of the air standards as outlined in the most recent FLAG guidance.

Typical design and mitigation measures may include: use of Tier IV or better engines, use of low sulfur fuels, electrification of well fields, flaring hydrocarbon and gases at high temperatures in order to reduce emissions of incomplete combustion; water dirt roads during periods of high use in order to reduce fugitive dust emissions; require that vapor recovery systems be maintained and functional in areas where petroleum liquids are stored; minimize roads and re-vegetate areas of the pad not required for production facilities to reduce the amount of dust from the pads.

Exception: None

Modification: None

Waiver: None

TIMING LIMITATION STIPULATION – 01

Wildlife and Plant Species: Bighorn Sheep Lambing Areas, Crucial Elk Calving and Mule Deer Fawning Habitat

Timing Limitation for Bighorn Sheep Lambing Areas, Crucial Elk Calving and Mule Deer Fawning Habitat

Where: Within potential bighorn sheep lambing areas modeled and mapped by the Forest Service, and crucial elk calving and mule deer fawning habitat delineated and mapped by UDWR.

No activities would be allowed during the critical time period May 1 to July 5.

For the Purpose Of: Protecting lambing areas and crucial elk calving and mule deer fawning habitat by precluding activities which could cause increased stress and/or displacement.

Exception: An exception may be granted if there are no practical alternatives, and the Forest Supervisor determines through analysis, and in coordination with the Utah Division of Wildlife Resources that the nature of the actions, as proposed or conditioned, could be fully mitigated.

Modification: None

Waiver: None

TL – 01

TIMING LIMITATION STIPULATION – 02
Wildlife and Plant Species: Crucial Elk and Mule Deer Winter Range

Timing Limitation for Crucial Elk and Mule Deer Winter Range

Where: Within crucial elk and mule deer winter range delineated and mapped by UDWR.

No activities would be allowed during the critical time period December 1 to April 15.

For the Purpose Of: Protecting crucial elk and mule deer winter range by precluding activities which could cause increased stress and/or displacement.

Exception: An exception may be granted if there are no practical alternatives, and the Forest Supervisor determines through analysis and in coordination with the Utah Division of Wildlife Resources that the nature of the actions, as proposed or conditioned, could be fully mitigated. This might occur if seasonal conditions are such that the animals have moved and are not using the specified area during the time they would normally be expected. Factors to be considered would include elk presence or expected elk presence, snow depth, temperature, snow crusting, location of disturbance, forage quantity and quality, animal condition, and expected duration of disturbance.

Modification: A modification may be granted if the Forest Supervisor determines through new habitat studies, coordinated with the Utah Division of Wildlife Resources, that a portion of the leasehold affected by this stipulation does not contain crucial elk winter range.

Waiver: None

TL – 02

TIMING LIMITATION STIPULATION – 03
Wildlife and Plant Species: Bighorn Sheep Winter Range

Timing Limitation for Bighorn Sheep Winter Range

Where: Within potential bighorn sheep winter range modeled and mapped by the Forest Service.

No activities would be allowed during the critical time period November 1 to April 15.

For the Purpose Of: Protecting bighorn sheep winter range by precluding activities which could cause increased stress and/or displacement.

Exception: An exception may be granted if there are no practical alternatives, and the Forest Supervisor determines through analysis and in coordination with the Utah Division of Wildlife Resources that the nature of the actions, as proposed or conditioned, could be fully mitigated. This might occur if seasonal conditions are such that the animals have moved and are not using the specified area during the time they would normally be expected.

Modification: A modification may be granted if the Forest Supervisor determines through new habitat studies, coordinated with the Utah Division of Wildlife Resources, that a portion of the leasehold affected by this stipulation does not contain bighorn sheep winter range.

Waiver: None

TIMING LIMITATION STIPULATION – 04
Wildlife and Plant Species: Greater Sage Grouse Brood-rearing Habitat

Timing Limitation for Sage Grouse Brood-rearing Habitat

Where: Within sage grouse brood-rearing habitat delineated and mapped by UDWR.

No activities would be allowed during the period May 1 through July 5.

For the Purpose Of: Protecting sage grouse during the critical breeding season by precluding activities which could cause increased stress, displacement, and/or breeding failures.

Exception: An exception may be granted if the Forest Supervisor, in coordination with the Utah Division of Wildlife Resources, determines through analysis that the nature of the actions, as proposed or conditioned, could be fully mitigated.

Modification: A modification may be granted if the Forest Supervisor determines through coordination with the Utah Division of Wildlife Resources, that new habitat studies demonstrate a portion of the lease area affected by this stipulation no longer contains brood-rearing habitat.

Waiver: A waiver may be granted if the Forest Supervisor determines through coordination with the Utah Division of Wildlife Resources, that new habitat studies demonstrate the entire lease area affected by this stipulation no longer contains brood-rearing habitat.

TL – 04

TIMING LIMITATION STIPULATION – 05
Wildlife and Plant Species: Greater Sage Grouse Winter Habitat

Timing Limitation for Sage Grouse (Structures in Winter Habitat)

Where: Within sage grouse winter habitat delineated and mapped by UDWR.

For the Purpose Of: Protecting wintering sage grouse from predation, habitat fragmentation, and disturbance during the critical period from December 1 to March 15.

Exception: An exception may be granted if the Forest Supervisor, in coordination with the Utah Division of Wildlife Resources, determines through analysis that the nature of the actions, as proposed or conditioned, could be fully mitigated.

Modification: A modification may be granted if the Forest Supervisor determines through consultation with the U.S. Fish and Wildlife Service and coordination with the Utah Division of Wildlife Resources, that new habitat studies demonstrate a portion of the lease area affected by this stipulation no longer contains winter habitat.

Waiver: A waiver may be granted if the Forest Supervisor determines through coordination with the Utah Division of Wildlife Resources, that new habitat studies demonstrate the entire lease area affected by this stipulation no longer contains winter habitat.

Lease Notices for Oil and Gas Development on

Lands Administered by the Fishlake National Forest

Under Jurisdiction of
Department of Agriculture

In conducting operations associated with this lease, the lessee/operator must comply with all the rules and regulations of the Secretary of Agriculture set forth at Title 36, Chapter II, of the Code of Federal Regulations governing the use, occupancy, and management of National Forest System (NFS) lands when not inconsistent with existing lease rights granted by the Secretary of Interior.

All matters related to this notice are to be addressed to:

Forest Supervisor
Fishlake National Forest
115 E. 900 N.
Richfield, Utah 84701
Telephone: **435 896-9233**

who is the authorized representative of the Secretary of Agriculture.

CULTURAL RESOURCES (National Historic Preservation Act of 1966 (NHPA), P.L. 89-665 as amended by P.L. 94-422, P.L. 94-458, and P.L. 96-515):

The Forest Service authorized officer is responsible for ensuring that the leased lands are examined prior to the undertaking of any ground-disturbing activities to determine whether or not cultural resources are present, and to specify mitigation measures for effects on cultural resources that are found to be present.

The lessee or operator shall contact the Forest Service to determine if a site-specific cultural resource inventory is required prior to undertaking any surface-disturbing activities on Forest Service lands covered by this lease.

The lessee or operator may engage the services of a cultural resource specialist acceptable to the Forest Service to conduct any necessary cultural resource inventory of the area of proposed surface disturbance. In consultation with the Forest Service authorized officer, the lessee or operator may elect to conduct an inventory of a larger area to allow for alternative or additional areas of disturbance that may be needed to accommodate other resource needs or operations.

The lessee or operator shall implement mitigation measures required by the Forest Service to preserve or avoid destruction of cultural resource values. Mitigation may include relocation of proposed facilities, testing, salvage, and recordation or other protective measures.

During the course of actual surface operations on Forest Service lands associated with this lease, the lessee or operator shall immediately bring to the attention of the Forest Service the discovery of any cultural or paleontological resources. The lessee or operator shall leave such discoveries intact until directed to proceed by Forest Service.

THREATENED OR ENDANGERED SPECIES (The Endangered Species Act. (ESA), P.L. 93-205 (1973), P.L. 94-359 (1974), P.L. 95-212 (1977), P.L. 95-632 (1978), P.L. 96-159 (1979), P.L. 97-304 (1982), P.L. 100-653 (1988)).

The Forest Service authorized officer is responsible for compliance with the Endangered Species Act. This includes meeting ESA Section 7 consultation requirements with the U.S. Fish and Wildlife Service prior to any surface disturbing activities associated with this lease with potential effects to species and/or habitats protected by the ESA. The results of consultation may indicate a need for modification of or restrictions on proposed surface disturbing activities.

The lessee or operator may choose to conduct the examination at their cost. Results of the examination will be used in any necessary ESA consultation procedures. This examination and any associated reports, including Biological Assessments, must be done by or under the supervision of a qualified resource specialist approved by the Forest Service. Any reports must also be formally approved by the USDA Forest Service biologist or responsible official.

LEASE NOTICE – Mexican Spotted Owl:

The Lessee/Operator is given notice that the lands in this lease contain suitable habitat for Mexican spotted owl, a federally listed species. Insert the following if lease contains Designated Critical Habitat: [The Lessee/Operator is given notice that the lands in this lease contain Designated Critical Habitat for the Mexican spotted owl, a federally listed species. Critical habitat was designated for the Mexican spotted owl on August 31, 2004 (69 FR 53181-53298).] Avoidance or use restrictions may be placed on portions of the lease. Application of appropriate measures will depend on if the action is temporary or permanent, and whether it occurs within or outside the owl nesting season. A temporary action is completed prior to the following breeding season leaving no permanent structures and resulting in no permanent habitat loss. A permanent action continues for more than one breeding season and/or causes a loss of owl habitat or displaces owls through disturbances, i.e. creation of a permanent structure.

The following avoidance and minimization measures have been designed to ensure activities carried out on the lease are in compliance with the Endangered Species Act. Integration of and adherence to these measures will facilitate review and analysis of any submitted permits under the authority of this lease. Following these measures could reduce the scope of ESA Section 7 consultation at the permit stage.

Current avoidance and minimization measures include the following:

1. Surveys following Forest Service approved protocol will be required prior to operations unless species occupancy and distribution information is complete and available. All surveys must be conducted by qualified individual(s).
2. Assess habitat suitability for both nesting and foraging using accepted habitat models in conjunction with field reviews. Apply the conservation measures below if project activities occur within 0.5 mile of suitable owl habitat. Determine potential effects of actions to owls and their habitat. Document type of activity, acreage and location of direct habitat impacts, type and extent of indirect impacts relative to location of suitable owl habitat. Document if action is temporary or permanent.

3. Lease activities will require monitoring throughout the duration of the project. To ensure desired results are being achieved, minimization measures will be evaluated and, if necessary, Section 7 consultation reinitiated.
4. Produced water will be managed to ensure maintenance or enhancement of riparian habitat.
5. Where technically and economically feasible, use directional drilling or multiple wells from the same pad to reduce surface disturbance and eliminate drilling in canyon habitat suitable for Mexican spotted owl nesting.
6. For all temporary actions that may impact owls or suitable habitat:
    a. If the action occurs entirely outside of the owl breeding season (March 1- August 31), and leaves no permanent structure or permanent habitat disturbance, action can proceed without an occupancy survey.
    b. If action will occur during a breeding season, survey for owls prior to commencing activity. If owls are found, consultation with USFWS must be reinitiated and activity must be delayed until consultation is completed.
    c. Rehabilitate access routes created by the project through such means as raking out scars, revegetation, gating access points, etc.
7. For all permanent actions that may impact owls or suitable habitat:
    a. Survey two consecutive years for owls according to accepted protocol prior to commencing activities.
    b. If owls are found, no actions will occur within 0.5 mile of identified nest site. If nest site is unknown, no activity will occur within the designated Protected Activity Center (PAC).
    c. Avoid drilling and permanent structures within 0.5 mi of suitable habitat unless surveyed and not occupied.
    d. Reduce noise emissions (e.g., use hospital-grade mufflers) to 45 dBA at 0.5 mile from suitable habitat, including canyon rims. Placement of permanent noise- generating facilities should be determined by a noise analysis to ensure noise does not encroach upon a 0.5 mile buffer for suitable habitat, including canyon rims.
    e. Limit disturbances to and within suitable habitat by staying on approved routes.
    f. Limit new access routes created by the project.

Additional measures to avoid or minimize effects to the species may be developed and implemented in consultation with the U.S. Fish and Wildlife Service between the lease sale stage and lease development stage to ensure continued compliance with the Endangered Species Act.

LEASE NOTICE – California Condor:

The Lessee/Operator is given notice that the lands located in this parcel contain potential habitat for the California condor, a federally listed species. Avoidance or use restrictions may be placed on portions of the lease if the area is known or suspected to be used by condors. Application of appropriate measures will depend on whether the action is temporary or permanent, and whether it occurs within or outside potential habitat. A temporary action is completed prior to the following important season of use, leaving no permanent structures and resulting in no permanent habitat loss. This would include consideration for habitat functionality. A permanent action continues for more than one season of habitat use, and/or causes a loss of condor habitat function or displaces condors through continued disturbance (i.e. creation of a permanent structure requiring repetitious maintenance, or emits disruptive levels of noise).

The following avoidance and minimization measures have been designed to ensure activities carried out on the lease are in compliance with the Endangered Species Act. Integration of and adherence to these measures will facilitate review and analysis of any submitted permits under the authority of this lease. Following these measures could reduce the scope of Endangered Species Act, Section 7 consultation at the permit stage.

Current avoidance and minimization measures include the following:

1. Surveys will be required prior to operations unless species occupancy and distribution information is complete and available. All Surveys must be conducted by qualified individual(s) approved by the Forest Service, and must be conducted according to approved protocol.
2. If surveys result in positive identification of condor use, all lease activities will require monitoring throughout the duration of the project to ensure desired results of applied mitigation and protection. Minimization measures will be evaluated during development and, if necessary, Section 7 consultation may be reinitiated.
3. Temporary activities within 1.0 mile of nest sites will not occur during the breeding season.
4. Temporary activities within 0.5 miles of established roosting sites or areas will not occur during the season of use, August 1 to November 31, unless the area has been surveyed according to protocol and determined to be unoccupied.
5. No permanent infrastructure will be placed within 1.0 mile of nest sites.
6. No permanent infrastructure will be placed within 0.5 miles of established roosting sites or areas.
7. Lessee is responsible to remove big game carrion (which may be an unwanted attractant) to 100 feet from on lease roadways occurring within foraging range as feasible in coordination with the UDWR and the Forest Service.

Where technically and economically feasible, use directional drilling or multiple wells from the same pad to reduce surface disturbance and eliminate drilling in suitable habitat.

Additional measures may also be employed to avoid or minimize effects to the species between the lease sale and lease development stages. These additional measures will be developed and implemented in consultation with the U.S. Fish and Wildlife Service to ensure continued compliance with the Endangered Species Act.

LEASE NOTICE – Western Yellow-billed Cuckoo:

The Lessee/Operator is given notice that the lands located in this parcel contain potential habitat for the Western yellow-billed cuckoo, a federally listed species. In areas that contain riparian habitat within the range of the species, actions that may cause stress and disturbance during nesting and rearing of young would be avoided or restricted. Appropriate measures will depend on if the action is temporary or permanent, and whether it occurs within or outside the nesting season. A temporary action is completed prior to the breeding season leaving no permanent structures and resulting in no permanent habitat loss. A permanent action continues for more than one breeding season and/or causes a loss of habitat or displaces individuals through disturbances. Current avoidance and minimization measures include the following:

1. Surveys would be required prior to operations unless species occupancy and distribution information is complete and available. All surveys must be conducted by qualified individual(s) and be conducted according to protocol.

2. Activities would require monitoring throughout the duration of the project. To ensure desired results are being achieved, minimization measures would be evaluated and, if necessary, Section 7 consultation reinitiated.
3. Water production would be managed to ensure maintenance or enhancement of riparian habitat.
4. Where technically and economically feasible, use directional drilling or multiple wells from the same pad to reduce surface disturbance and eliminate drilling in suitable riparian habitat. Ensure that such directional drilling does not intercept or degrade alluvial aquifers.
5. Activities would maintain a 300 feet buffer from suitable riparian habitat year long.
6. Activities within ¼ mile of occupied breeding habitat would not occur during the breeding season of May 1 to August 15.
7. Ensure that water extraction or disposal practices do not result in change of hydrologic regime that would result in loss or degradation of riparian habitat.
8. Re-vegetate with native species all areas of surface disturbance within riparian areas and/or adjacent land.

Additional measures to avoid or minimize effects to the species may be developed and implemented in consultation with the USFWS between the lease sale stage and lease development stage to ensure continued compliance with the ESA.

LEASE NOTICE – Migratory Birds:

The lessee/operator is given notice that surveys for nesting migratory birds may be required during migratory bird breeding season whenever surface disturbances and/or occupancy is proposed in association with fluid mineral exploration and development within priority habitats. Surveys should focus on identified priority bird species in Utah. Field surveys will be conducted as determined by the authorized officer of the USDA Forest Service. Based on the result of the field survey, the authorized officer will determine appropriate buffers and timing limitations. This notice may be waived, excepted, or modified by the authorized officer if either the resource values change or the lessee/operator demonstrates that adverse impacts can be mitigated.

LEASE NOTICE - Sensitive and MIS Species (Plants and Wildlife):

The Lessee/Operator is given notice that the lands in this parcel contain suitable habitat for sensitive, and/or management indicator species. The following avoidance and minimization measures have been developed to facilitate locating and designing operations to avoid adverse effects to the viability of these species.

Prior to conducting any surface disturbing activities within suitable habitat for sensitive and Management Indicator Species (MIS), surveys would need to be completed. If sensitive or MIS are found, ground disturbing activities may be moved up to ½ mile to buffer around occupied habitat that is essential to the persistence of the species on the Fishlake National Forest.

LEASE NOTICE - Utah Prairie Dog:

The lessee/operator is given notice that lands in this lease may contain historic and/or occupied Utah prairie dog habitat, a threatened species under the Endangered Species Act. Avoidance or use restrictions may be placed on portions of the lease. Application of appropriate measures will depend whether the action is temporary or permanent, and whether it occurs when prairie dogs are active or hibernating. A temporary action is completed prior to the following active season leaving no permanent structures and resulting in no permanent habitat loss. A permanent action continues for more than one activity/hibernation season and/or causes a loss of Utah prairie dog habitat or displaces prairie dogs through disturbances, i.e. creation of a permanent structure.

The following avoidance and minimization measures have been designed to ensure activities carried out on the lease are in compliance with the Endangered Species Act. Integration of, and adherence to these measures will facilitate review and analysis of any submitted permits under the authority of this lease. Following these measures could reduce the scope of Endangered Species Act, Section 7 consultation at the permit stage.

Current avoidance and minimization measures include the following:

1. Surveys will be required prior to operations unless species occupancy and distribution information is complete and available. All Surveys must be conducted by qualified individual(s) approved by the Forest Service (i.e., needs to have passed the USFWS Utah Prairie Dog survey course).
2. Lease activities will require monitoring throughout the duration of the project. To endure desired results are being achieved, minimization measures will be evaluated and, if necessary, Section 7 consultation reinitiated.
3. Where technically and economically feasible, use directional drilling or multiple wells from the same pad to reduce surface disturbance and eliminate drilling in prairie dog habitat.
4. Surface occupancy or other surface disturbing activity will be avoided within 0.5 mile of active prairie dog colonies.
5. Permanent surface disturbance or facilities will be avoided within 0.5 mile of potentially suitable, unoccupied prairie dog habitat, identified and mapped by Utah Division of Wildlife Resources.
6. The lessee/operator should consider if fencing infrastructure on well pad, e.g., drill pads, tank batteries, and compressors, would be needed to protect equipment from burrowing activities. In addition, the operator should consider if future surface disturbing activities would be required at the site.
7. Within occupied habitat, set a 25 mph speed limit on operator-created and access roads and adhere to speed limit on maintained roads. The speed limit may have to be revisited on a site-specific basis and reduced.
8. Limit disturbances to and within suitable habitat by staying on designated routes.
9. Limit new access routes created by the project.
10. Unavoidable impacts to the species will be mitigated through site-specific consultation with the US Fish and Wildlife Service.

Additional measures to avoid or minimize effects to the species may be developed and implemented in consultation with the U.S. Fish and Wildlife Service between the lease sale stage and lease development stage to ensure continued compliance with the Endangered Species Act.

Lease Notice - Drinking Water Source Protection Zones

The following is required language for approval for Oil and Gas activities with source water protections zones: This lease (or a portion thereof) has been determined to be within a public Drinking Water Source Protection Zone. Prior to any surface-disturbing activity, the lessee/operator must contact the BLM field office and the public water system manager to determine any zoning ordinances, best management or pollution prevention measures, or physical controls that may be required within the protection zone(s). Compliance with Drinking Water Source Protection plans, developed by public water systems under the requirements of R309-600, Drinking Water Source Protection for Ground-Water Sources (Utah

Administrative Code), is mandatory. Compliance with county ordinances to protect the source protection zones, as required by Section 19-4-113 of the Utah Code, is also mandatory.

Some public water sources qualify for monitoring waivers which reduce their monitoring requirements for pesticides and volatile organic chemicals (VOCs). Exploration, drilling, and production activities within Source Protection zones could jeopardize these waivers, thus requiring increased monitoring. The operator must contact the public water system administrator to determine what effect their activities may have on the public water system's monitoring waivers. Compliance with other Utah State rules to protect surface and ground water such as the Utah Division of Water Quality Rule R317 (Water Quality Rules) and Rule R649 (Rules of the Utah Division of Oil, Gas and Mining, Utah Oil and Gas Conservation) is required.

Lease Notice - Drinking Water Source Protection Zone Condition of Approval (COA)

The following is required language for approval for Oil and Gas activities with source water protections zones: This lease (or a portion thereof) has been determined to be within a public Drinking Water Source Protection Zone. Prior to any surface-disturbing activity, the lessee/operator must contact the BLM field office and the public water system manager to determine any zoning ordinances, best management or pollution prevention measures, or physical controls that may be required within the protection zone(s). Compliance with Drinking Water Source Protection plans, developed by public water systems under the requirements of R309-600, Drinking Water Source Protection for Ground-Water Sources (Utah Administrative Code), is mandatory. Compliance with county ordinances to protect the source protection zones, as required by Section 19-4-113 of the Utah Code, is also mandatory.

Some public water sources qualify for monitoring waivers which reduce their monitoring requirements for pesticides and volatile organic chemicals (VOCs). Exploration, drilling, and production activities within Source Protection zones could jeopardize these waivers, thus requiring increased monitoring. The operator must contact the public water system administrator to determine what effect their activities may have on the public water system's monitoring waivers. Compliance with other Utah State rules to protect surface and ground water such as the Utah Division of Water Quality Rule R317 (Water Quality Rules) and Rule R649 (Rules of the Utah Division of Oil, Gas and Mining, Utah Oil and Gas Conservation) is required.

Groundwater Protection Zones 1-4:

This lease (or a portion thereof) is within one or more Drinking Water Source Protection Zones (DWSPZs) designated by the Utah Division of Drinking Water (DDW). Prior to a lease being offered up for sale that overlies a DWSPZ the BLM would attach IM No. UT 2010-055, Attachment F (Utah Drinking Water Source Protection Zone Lease Notice).

BLM's rules and regulations outlined in 43 CFR §3162.4-2, §3162.5-1(a) and §3162.5-2 (d) Control of wells, Onshore Oil and Gas Orders Nos. 2 and 7, and the Gold Book have been developed to address potential impacts to ground water from the drilling and completion of oil and gas wells, including the construction and use of reserve and production pits. Specifically, §3162.5-2 (d) Protection of fresh water and other minerals requires that the operator shall isolate freshwater-bearing and other usable water containing 5,000 ppm or less dissolved solids and Onshore Order No. 2 increases the requirement by establishing a 10,000 ppm total dissolved solids (TDS) threshold for protection of usable water.

Concurrent with submittal of an application for a permit to drill (APD), or any proposed surface disturbing activity, the lessee/operator must provide the BLM Authorized Officer (AO) protective measures, which adequately address protection of the DWSPZ or other usable ground water zones. If operator proposed measures are considered insufficient to adequately protect the water zones, the AO will incorporate additional protective measures as condition(s) of approval (COAs). During further analysis at time of APD approval, the BLM would attach IM No. UT 2010-055, Attachment G (Utah Drinking Water Source Protection Zone COA).

Geophysical logs will be required in order to determine cement integrity and subsequent protection /isolation of usable ground water resources. Upon well completion, additional testing may be required to verify well bore integrity for protection of usable ground water resources. Testing results will be evaluated to determine if effective implementation of mitigation measures has been achieved.

<u>Existing Transient Non-Community Water Systems – Zones T2 and T4</u>:

This lease (or a portion thereof) is within Drinking Water Source Protection Zones designated as a transient non-community water system which does not serve 25 of the same nonresident persons per day for more than 6 months per year by the Utah Division of Drinking Water. The Transient System T2 protection zone for existing wells or springs is the area within a 250-day ground-water time of travel to the wellhead, spring or margin of the collection area, the boundary of the aquifer(s) which supplies water to the ground-water source, or the ground-water divide, whichever is closer. The Transient System T4 protection zone for existing wells or springs is the area within a 10-year ground-water time of travel to the wellhead, spring or margin of the collection area, the boundary of the aquifer(s) which supplies water to the ground-water source, or the ground-water divide, whichever is closer. Compliance with R309-600 is voluntary for existing transient non-community water systems. However, all new ground water sources (including transient non-community systems) must submit to the DDW a Preliminary Evaluation Report (R309-600-13(2)) and a Drinking Water Source Protection Plan (R309-600-7(1)) which designates ground water source protection zones 1 through 4. Protection of the zones T2 and T4 must also comply with LEASE NOTICE – Groundwater Protection Zones 1-4.

<u>Surface Water Protection Zones 1-4:</u>

There currently are no Surface Water Protection Zones within the lands being proposed for leasing. But if any are created then the following Lease Notice for these zones would apply. This lease (or a portion thereof) is within public Drinking Water Source Protection Zones 1, 2, 3, and/or 4. Before application for a permit to drill (APD) submittal or any proposed surface disturbing activity, the lessee/operator must contact the BLM field office and the public water system manager to determine any zoning ordinances, best management or pollution prevention measures or physical controls that may be required within the protection zone. Drinking Water Source Protection plans are developed by the public water systems under the requirements of R309-605-7, Drinking Water Source Protection for Surface Sources (Utah Administrative Code). There may also be county ordinances in place to protect the source protection zones, as required by Section 19-4-113 of the Utah Code.

Incorporated cities and towns may also protect their drinking water sources using Section 10-8- 15 of the Utah Code. Cities and town have the extraterritorial authority to enact ordinances to protect a source of drinking water ... "For 15 miles above the point from which it is taken and for a distance of 300 feet on each side of such stream..." Class I cities (greater than 100,000 population) are granted authority to protect their entire watersheds.

Some public water sources qualify for monitoring waivers which reduce their monitoring requirements for pesticides and volatile organic chemicals (VOCs). Exploration, drilling and production activities within a Source Protection Zone could jeopardize these waivers, thus requiring increased monitoring. Contact the public water system to determine what effect your activities may have on their monitoring waivers. Please be aware of other state rules to protect surface and ground water, including Utah Division of Water Quality Rules R317 Water Quality Rules; and Rules of the Utah Division of Oil, Gas and Mining, Utah Oil and Gas Conservation Rules R649.

During further analysis at time of APD the BLM would attach IM No. UT 2010-055, Attachment G - Utah Drinking Water Source Protection Zone COA.

At the time of development, drilling operators will additionally conform to the BLM operational regulations and Onshore Oil and Gas Order No. 7 (which prescribes measures required for the handling of produced water to ensure the protection of surface and ground water sources) and the Surface Operating Standards and Guidelines for Oil and Gas Development, The Gold Book, Fourth Edition-Revised 2007 (which provides information and requirements for conducting environmentally responsible oil and gas operations).

Sole Source Aquifers

There currently are no Sole Source Aquifers within the lands being proposed for leasing. But if any are created then the following Lease Notice for these zones would apply. This lease (or a portion thereof) is within Sole Source Aquifer Protection zone designated by the Environmental Protection Agency (EPA). BLM's rules and regulations outlined in 43 CFR §3162.4-2, §3162.5-1(a) and §3162.5-2 (d) Control of wells, Onshore Oil and Gas Orders Nos. 2 and 7, and the Gold Book have been developed to address potential impacts to ground water from the drilling and completion of oil and gas wells, including the construction and use of reserve and production pits. Specifically, §3162.5-2 (d) Protection of fresh water and other minerals requires that the operator shall isolate freshwater-bearing and other usable water containing 5,000 ppm or less dissolved solids and Onshore Order No. 2 increases the requirement by establishing a 10,000 ppm total dissolved solids (TDS) threshold for protection of usable water.

During further analysis at time of APD the BLM would attach IM No. UT 2010-055, Attachment G - Utah Drinking Water Source Protection Zone COA.

Concurrent with submittal of an application for a permit to drill (APD), or any proposed surface-disturbing activity, the lessee/operator must provide the BLM Authorized Officer (AO) protective measures, which adequately address protection of the Sole Source Aquifer and other usable ground water zones. If operator proposed measures are considered insufficient to adequately protect the water zones, the AO will incorporate additional protective measures as condition(s) of approval (COAs).

Geophysical logs will be required in order to determine cement integrity and subsequent protection/isolation of usable ground water resources. Upon well completion, additional testing may be required to verify well bore integrity for protection of usable ground water resources. Testing results will be evaluated to determine if effective implementation of mitigation measures has been achieved.

Floodplains and Wetland (EO 11988; EO 11990):

The lessee is hereby notified that this lease may contain land within a riparian or wetland ecosystem.

All activities within this area may be precluded or highly restricted in order to comply with Executive Order 11988 - Floodplain Management and Executive Order 11990 - Protection of Wetlands, in order to preserve and restore or enhance the natural and beneficial values served by floodplains and wetlands.

Occupancy and use of lands within riparian or wetland areas, as proposed in a Surface Use Plan of Operations, will be considered in an environmental analysis and mitigation measures deemed necessary to protect these areas identified. These areas are to be avoided to the extent possible, or special measures such as road design, well pad size and location or directional drilling, may be made part of the permit authorizing the activity.

LEASE NOTICE - Air Resources: (Clean Air Act of 1963, as amended by P.L. 90-148, P.L. 91-604, and P.L. 101-549; National and State of Utah Ambient Air Quality Standards, National Standards of Performance for New Stationary Sources, National Prevention of Significant Deterioration Standards, National Emissions Standards for Hazardous Air Pollutants, Utah Air Conservation Regulations (R446), and Utah State Implementation Plan)

1. The operator shall comply with the following practices to control impacts to ambient air quality from oil and gas exploration and production activities:

    a. As appropriate, quantitative analysis of potential air quality impacts will be conducted for project-specific developments by the operator, in concert with direction from the Utah Department of Environmental Quality, Division of Air Quality (UDAQ), the Forest Service and cooperating federal land management agencies including but not limited to the National Park Service. The Forest Service will notify cooperating agencies as project specific proposals are received and additional air impact analyses are performed to ensure input from those agencies. Additional project specific air impact analyses would need to be conducted if the following project criteria are fulfilled:

        i. If an exploration drilling project is proposed within 5km of an adjacent Class I area, air quality related value (AQRV) impacts would need to be addressed utilizing at a minimum the VISCREEN screening tool. Additional air impact analyses may be necessary based on the review of the initial VISCREEN analysis.

        ii. If an oil and gas production project is proposed at a distance of over 60km from an adjacent Class I area and has emissions that exceed those utilized in the existing “Fishlake 12-well development scenario", A quantitative air quality impact analysis would need to be conducted for the project that follows the guidance found in the FLAG modeling guidelines.

        iii. If an oil and gas production project is proposed within 60km of an adjacent Class I area and has emissions that equal or exceed those utilized in the existing “Fishlake 12-well development scenario", a quantitative air quality impact analysis would need to be conducted for the project that follows the guidance found in the FLAG modeling guidelines.

iv. If an exploratory drilling or oil and gas development project is proposed to occur within 60km of an adjacent Class I area and has emissions that are greater than those utilized in the existing "exploratory drilling scenario" but less than those utilized in the "Dixie 20-well development scenario", consultation with the Forest Service and cooperating Federal Agencies would be required to determine an appropriate assessment of air quality impacts. The level of additional analysis would be predicated on the size of the proposed project.

b. Compliance with Utah Air Conservation (UAC) Regulation R446-1 would be necessary. The best air quality control technology, as per guidance from the UDAQ, will be applied to actions as needed to meet air quality standards.

c. The operator will comply with UAC Regulation R446-1-4.5.3, which prohibits the use, maintenance, or construction of roadways without taking appropriate dust abatement measures. Compliance will be obtained through special stipulations as a requirement on new projects and through the use of dust abatement control techniques in problem areas.

d. The operator will manage authorized activities to maintain air quality within the thresholds established by the State of Utah Ambient Air Quality Standards and to ensure that those activities continue to keep the area in attainment, meet prevention of significant deterioration (PSD) Class II standards, and protect the Class I air shed of the National Parks (e.g. Zion, Bryce Canyon, and Capitol Reef National Parks).

e. National Ambient Air Quality Standards will be enforced by the UDEQ, with EPA oversight. Special requirements to reduce potential air quality impacts will be considered on a case-by-case basis in processing land-use authorizations.

f. The operator will utilize BMPs and site specific mitigation measures, when appropriate, based on-site specific conditions, to reduce emissions and enhance air quality.

Examples of these types of measures can be found in the Four Corners Air Quality Task Force Report of Mitigation Options, November 1, 2007; EPA Natural Gas STAR Program

(http://www.epa.gov/gasstar/); and US Forest Service Emission Reduction Techniques for Oil and Gas activities 2011 (http://www.fs.fed.us/air/documents/EmissionReduction- 010711x.pdf).

g. The operator will comply with a Condition of Approval for Applications for Permit to Drill, which includes:

(1) All new and replacement internal combustion diesel fired drilling engines must meet or exceed Tier II emissions limits as codified in 40 CFR Part 89 -"Control of Emissions From New and In-Use Nonroad Compression-Ignition Engines".

2. All new and replacement internal combustion diesel fired well pump engines must meet or exceed Tier II emissions limits for Particulate Matter and Tier III emissions limits for Oxides of Nitrogen and Carbon Monoxide as codified in 40 CFR Part 89 - "Control of Emissions From New and In-Use Nonroad Compression-Ignition Engines".

3. All new and replacement spark ignited natural gas fired internal combustion well-pump engines must meet or exceed emissions limits for Oxides of Nitrogen, Carbon Monoxide and Volatile Organic Compounds from New Source Performance Standard Subpart JJJJ for Stationary Spark Ignition Internal Combustion Engines manufactured since 2008.

4. All new and replacement internal combustion gas field engines of less than or equal to 300 design-rated horsepower must not emit more than 2 grams of NOx per horsepower-hour. (This requirement does not apply to gas field engines of less than or equal to 40 designated horsepower).

5. All new and replacement internal combustion gas field engines of greater than 300 design rated horsepower must not emit more than 1.0 grams of NOx per horsepower-hour.

6. All diesel fuel fired internal combustion engines must utilize certified Ultra Low Sulfur Diesel fuel with a maximum sulfur content of 15 parts per million (PPM).

> a. Lease holders will need to conduct detailed volatile organic compound (VOC) emissions inventories for any proposed facilities to provide necessary data to the BLM Utah State Office for their regional photochemical modeling.
>
> b. Lease holders will need to examine the use of additional mitigations for ozone precursors.

APPENDIX I

Dixie National Forest Land and Resource Management Plan

(Forest Plan)

Amendment

LRMP page II-41

Remove the following paragraph on page II-41 of the LRMP:

> In summary 1,478,227 acres are presently available for mineral leasing on land administered by the Dixie National Forest and approximately 253,707 on land administered by the Fishlake National Forest. Mining entry is available on 1,173,319 acres.

Replace it with the following:

> In summary approximately 1,478,227 acres are presently available for mineral leasing on land administered by the Dixie National Forest and approximately 253,299 on land administered by the Fishlake National Forest. Mining entry is available on 1,173,319 acres.

LRMP page IV-59, IV-62, IV-65, IV-71, IV-80, IV-101, IV-142, IV-155, IV-157:

Insert the following at the beginning of "MANAGEMENT DIRECTION" for Mineral Management: Oil, Gas and Geothermal

1. For geothermal leasing on lands administered by the Fishlake National Forest and coal and geothermal leasing on lands administered by the Dixie National Forest,

LRMP Appendix C (a):

Remove "for the Teasdale Ranger District (administered by the Fishlake National Forest) from the title page

Replace with: "for geothermal leasing on the Teasdale Ranger District (administered by the Fishlake National Forest)

<u>LRMP Appendix C:</u>

Insert the following immediately after page C-73.

Procedure for Leasing

Oil and Gas Leasing Matrix

Stipulation Forms

Lease Notices

Appendix C(c)

for Oil and Gas Leasing on Lands Administered by the Fishlake National Forest

PROCEDURE FOR LEASING

The following leasing matrix provides the appropriate lease stipulations and lease notices that would be attached to each lease for each resource area administered by the Fishlake National Forest. Approximately 1,707,810 acres of National Forest System lands are administratively available for oil and gas leasing. Of the 1,707,810 acres administratively available 253,299 are within the boundaries of the Dixie National Forest (The Teasdale District) which is administered by the Fishlake National Forest. These leasing procedures are to be followed for National Forest System lands administered by the Fishlake. Oil and gas leases offered will include Standard Lease Terms and other applicable stipulations identified as necessary for resource protection. Lease stipulations serve to mitigate potential effects of Federal oil and gas activities. The lessee must accept these stipulations as conditions of purchasing the lease. These stipulations represent Forest Service decisions regarding the best means of avoiding or minimizing environmental impacts that may arise from the project while meeting the integrated resource management requirements of the Forest Plan. They are incorporated into the lease as an official attachment to the standard form. Potential lessees are made aware of stipulations prior to any lease sale. These stipulations include No Surface Occupancy (NSO), Timing Limitations (TL), and Controlled Surface Use (CSU). Lease Notices (LN) would be utilized to notify potential lessees of specific conditions or restrictions already in place by law or regulation. Fishlake National Forest Oil and Gas Construction and Operating Standards and Well Site Design Requirements provides a listing of regulations and guidance to future operations (Appendix F, Fishlake National Forest Oil and Gas Leasing Environmental Impact Statement).

Oil and Gas Leasing does not approve any ground disturbing activities. If lands are leased and the lessee proposes an Application Permit to Drill (APD) agencies would consider approval of ground disturbing activities. Approval of ground disturbing activities would require separate NEPA analysis and a separate decision for each proposal. Should issues or resources be identified at those times that warrant additional protection, the Forest Service can take full advantage of provisions included in the lease and prudent use of a provision in the Standard Lease Terms and Conditions (SLT&C) applicable in all leases that allows the surface management agency to require movement of proposed facilities up to 200 meters to avoid negatively affecting resources. The Standard Lease Terms and Conditions can be found in Bureau of Land Management for 3109-3 – Stipulations for Lands Under Jurisdiction of Department of Agriculture and Forest Service (Intermountain Region) Supplement A to form 3109-3 – Surface Disturbance Stipulation.

Exceptions, modifications, or waivers to the lease stipulations may be granted if oil and gas operations could be conducted without causing unacceptable impacts. Exceptions, modifications, or waivers must be consistent with the approved Forest Plan and all applicable regulatory provisions. If the Forest Supervisor determines that the waiver, exception, or modification involves an issue of major public concern, the waiver, exception, or modification would be subject to a 30 to 90 -day public review period (36 CFR § 219.8).

Oil and Gas Leasing Matrix

Lands Administered by the Fishlake National Forest

Leasing Stipulations by Resource Area

Resource Area	Stipulation
Watershed resources	
Geologic hazards/unstable soils	NSO-01
Steep slopes >35 percent	NSO-02
Riparian areas	NSO-03
Delineated wetlands	NSO-04
Perennial streams, reservoirs, springs, and lakes	NSO-05
Drinking Water Source Protection Zone	NSO-06
Wildlife and Plant Species	
T,E,S plants	NSO-07
Aquatic fauna	NSO-08
Greater Sage Grouse leks	NSO-09
Pygmy Rabbit colonies	NSO-10
Bald Eagle winter concentration areas	NSO-11
Mexican Spotted Owl PACs	NSO-12
Goshawk core nest areas	NSO-13
Goshawk PFAs	CSU-01
Active raptor nest areas	CSU-02
Bighorn Sheep lambing areas, crucial elk calving and mule deer fawning	TL-01
Crucial elk and mule deer winter range	TL-02
Bighorn Sheep winter range	TL-03
Greater Sage Grouse brood-rearing habitat	TL-04
Greater Sage Grouse winter habitat	TL-05
Visual resources	
High scenic integrity areas	NSO-14
Inventoried Roadless Areas	
Inventoried Roadless Areas	NSO-15
Recreation	
Developed recreation sites and National Recreation Trails	NSO-16
Other Resources	
Research Natural Areas	NSO-17
Forest Service Administrative Sites and facilities	NSO-18
Cultural Resources, Old Spanish Trail, Paradise Valley, Quitchupah Canyon	NSO-19
Air quality	CSU-03

NO SURFACE OCCUPANCY STIPULATION – 01
Watershed Resources: Geologic hazards/unstable soils

No Surface Occupancy for Geologic Hazards and Unstable Soils

Where: Within areas delineated and mapped by the Forest Service as containing geologic hazards and/or unstable soils.

For the Purpose Of: Protecting soil resources, because soils disturbed by construction and drilling activities on steep slopes would be difficult to reclaim. No well sites or production facilities may be constructed in these areas.

Exceptions: If after an environmental analysis the Forest Service authorized officer determines roads or other temp facilities may cross geologic hazards after a plan would be submitted by the operator and approved prior to construction and maintenance and include:

- An erosion control strategy
- A detailed slope stability analysis and plan for maintaining a stable slope
- A detailed restoration/reclamation plan
- Proper survey and design (with construction plans and drawings) by a certified engineer

Modification: A modification may be granted if an on-the-ground inspection of a proposed well site or facility shows an area of less than 35% slope exists and mass wasting - prone soils do not exist or that design of the site can mitigate erosion, failure, and reclamation concerns.
Waiver: None

NSO – 01

NO SURFACE OCCUPANCY STIPULATION – 02
Watershed Resources: Steep Slopes > 35%

No Surface Occupancy on Steep Slopes

Where: Within areas delineated and mapped by the Forest Service having slopes greater than 35 percent, and high erosion potential areas in north horn sediments with slopes greater than 25 percent.

For the Purpose Of: Protecting soil resources, because soils disturbed by construction and drilling activities on steep slopes would be difficult to reclaim.

Exception: If, after an environmental analysis, the Forest Supervisor determines (1) there are no other practical placement alternatives, and (2) impacts could be fully mitigated, surface occupancy in the NSO area may be authorized. Additionally, a plan would be submitted by the operator and approved prior to construction and maintenance and include:

- An erosion control strategy,
- A detailed restoration/reclamation plan, and
- Proper survey and design (with construction plans and drawings) by a certified engineer.

Modification: None

Waiver: None

NSO – 02

NO SURFACE OCCUPANCY STIPULATION – 03
Watershed Resources: Riparian Areas

No Surface Occupancy for Riparian Areas

Where: Within 300 feet of Forest Service delineated boundary of riparian areas.

For the Purpose Of: Protecting riparian ecosystems. Riparian ecosystems are managed by the Forest Service to protect from conflicting uses in order to provide healthy, self-perpetuating plant and water communities that will have optimum diversity and density of understory and overstory vegetation. No well sites or production facilities will be allowed, and oil and gas exploration and development will be moved outside of the riparian vegetation area. Construction of roads, pipelines, and other similar facilities must comply with direction in the Dixie National Forest Land and Resource Management Plan.

Exceptions: An exception could be authorized if: (a) an on-site review determines the area proposed to be impacted is not riparian; and (b) any additional mitigation that is determined to be necessary is fully implemented.

Modification: None

Waiver: None

NSO – 03

NO SURFACE OCCUPANCY STIPULATION – 04
Watershed Resources: Delineated Wetlands

No Surface Occupancy for Delineated Wetlands

Where: Within 300 feet of delineated and mapped boundary of jurisdictional wetlands.

For the Purpose Of: Protecting jurisdictional wetlands relative to Executive Order 11990, and the associated habitats, water quality, and ecosystems associated with these areas. In order to protect these areas no well sites or production facilities may be constructed in these areas, and oil and gas exploration and development will be moved out of wetlands. Construction of roads, pipelines, and other facilities must comply with direction in the Dixie National Forest Land and Resource Management Plan.

Exceptions: An exception could be authorized if: (a) an on-site review determines the area proposed to be impacted is not a jurisdictional wetland; and (b) any additional mitigation that is determined to be necessary is fully implemented.

Modification: None

Waiver: None

NSO – 04

NO SURFACE OCCUPANCY STIPULATION – 05
Watershed Resources: Perennial Streams, Reservoirs, Springs, and Lakes

No Surface Occupancy for Perennial Streams, Reservoirs, Springs, and Lakes

Where: Within 300 feet of all perennial streams, reservoirs, springs and lakes.

For the Purpose Of: Protection of water quality in surface water resources.

Exceptions: None

Modification: None

Waiver: None

NSO – 05

NO SURFACE OCCUPANCY STIPULATION – 06
Watershed Resources: Drinking Water Source Protection Zones

No Surface Occupancy for Drinking Water Source Protection Zones (Protection Zones 1 – 3, and T2 and T4)

Where: Within the delineated boundary of DWSPZs.

For the Purpose Of: Protecting public drinking water sources in municipal and transient water protection zones.

Exception: An exception may be granted for road construction if it is determined by site-specific analysis that: building the road in a water source protection zone has the least impact on the environment; roads already exist in the area; and the local municipality approves.

Modification: None

Waiver: None

NSO – 06

NO SURFACE OCCUPANCY STIPULATION – 07
Wildlife and Plant Species: Threatened, Endangered, Proposed and Sensitive Plants

No Surface Occupancy for TEP Plant Locations and Sensitive Plant Conservation Agreement Areas

Where: Areas within one mile of known federally Threatened, Endangered or Proposed plant locations, and areas within one mile of Sensitive plant locations covered under a conservation agreement.

For the purpose of: Protecting and conserving federally Threatened, Endangered, Proposed, and Sensitive plant populations.

Exceptions: An exception may be granted if through site specific study, and in cooperation with the US Fish and Wildlife Service, an area is determined to not be providing suitable habitat for any federally Threatened, Endangered, Proposed or Sensitive plants.

Modification: None

Waiver: None

NSO – 07

NO SURFACE OCCUPANCY STIPULATION – 08
Wildlife and Plant Species: Aquatic Fauna

No Surface Occupancy in Key Habitats for Boreal Toad

Where: Within key boreal toad habitat delineated and mapped by the Forest Service.

For the purpose of: Protecting key habitat and known locations of boreal toad.

Exceptions: None

Modifications: None

Waivers: None

NSO – 08

NO SURFACE OCCUPANCY STIPULATION – 09
Wildlife and Plant Species: Greater Sage Grouse Leks

No Surface Occupancy in Sage Grouse Leks

Where: Within 4 miles of sage grouse leks delineated and mapped by the Forest Service.

For the purpose of: Protecting breeding and brood-rearing sage grouse from predation, habitat fragmentation, and disturbance.

Exceptions: An exception may be granted if the Forest Supervisor, in coordination with the Utah Division of Wildlife Resources, determines through analysis that the nature of the actions, as proposed or conditioned, could be fully mitigated. This might occur if topography and/or vegetation are present that would effectively screen the structure or facility from the breeding habitat.

Modifications: None

Waivers: None

NSO – 09

NO SURFACE OCCUPANCY STIPULATION – 10
Wildlife and Plant Species: Pygmy Rabbit Colonies

No Surface Occupancy in Known Pygmy Rabbit Colonies

Where: Within pygmy rabbit colonies delineated and mapped by the Forest Service.

For the purpose of: Protecting known populations of pygmy rabbits and their habitat.

Exceptions: None

Modifications: None

Waivers: None

NSO – 10

NO SURFACE OCCUPANCY STIPULATION – 11
Wildlife and Plant Species: Bald Eagle Winter Concentration Areas

No Surface Occupancy in Bald Eagle Winter Concentration Areas

Where: Within bald eagle winter concentration areas delineated and mapped by the Forest Service.

For the purpose of: Protecting bald eagles in their wintering habitat.

Exceptions: An exemption may be granted if it is determined through site-specific analysis that the area is not suitable habitat.

Modifications: None

Waivers: None

NSO – 11

NO SURFACE OCCUPANCY STIPULATION – 12
Wildlife and Plant Species: Mexican Spotted Owl PACs

No Surface Occupancy in Mexican Spotted Owl Protected Activity Centers (PACs)

Where: Within delineated and mapped Mexican spotted owl PACs**.**

For the purpose of: Protecting habitat areas for Mexican spotted owl that are not fully protected by the Endangered Species Act, which include all non-Critical Habitat areas.

Exceptions: None

Modifications: None

Waivers: None

NSO – 12

NO SURFACE OCCUPANCY STIPULATION – 13
Wildlife and Plant Species: Goshawk Core Nest Areas

No Surface Occupancy in Goshawk Core Nesting Areas

Where: Areas delineated by the Forest Service as core nesting areas for northern goshawk. Known goshawk nest areas are confidential and are not shown on any maps in the EIS.

For the purpose of: Maintaining the integrity of nesting habitat structure and the character of the surrounding habitat within a territory.

Exception: None

Modification: None

Waiver: The Authorized Officer may grant a waiver if conditions have changed such that there is no reasonable likelihood that the lease area can support further nesting activity. A waiver to the above lease stipulation may be requested along with the submission of a Surface Use Plan of Operations (36 CFR 228.104).

Any Changes to this stipulation will be made in accordance with the Forest Plan and/or the regulatory provisions for such changes (For guidance on the use of this stipulation, see BLM Manual 1624 and 3101 or FS Manual 1950 and 2820).

NSO – 13

NO SURFACE OCCUPANCY STIPULATION – 14
Visual Resources: High Scenic Integrity Areas

No Surface Occupancy for Areas with High Scenic Integrity

Where: Within areas designated as High Scenic Integrity.

For the Purpose Of: Preserving and maintaining High Scenery Integrity Objectives where there are primary important travel routes or use areas where users have a major concern for the aesthetics of the viewed landscape.

Exception: Based on site specific review, an exception may be granted if the effects of the proposed activity will not cause the area to fall below a high scenic integrity objective.

Modification: None

Waiver: None

NSO – 14

NO SURFACE OCCUPANCY STIPULATION – 15
Inventoried Roadless Areas: Inventoried Roadless Areas

No Surface Occupancy in Inventoried Roadless Areas

Where: Frequently viewed areas of high scenic integrity

For the Purpose Of: Protecting the roadless and wilderness characteristics of these lands. No well sites or production facilities will be allowed on these lands. Construction of roads, pipelines, or other facilities must comply with direction in the Forest Plan.

Exception: None

Modification: None

Waiver: None

NSO – 15

NO SURFACE OCCUPANCY STIPULATION – 16
Recreation: Developed Recreation Sites and National Recreation Trails

No Surface Occupancy for Developed Recreation Sites and National Recreation Trails

Where: Within ¼ mile of developed recreation sites and national recreation trails.

For the Purpose Of: Protecting the capital investment and recreation uses associated with these sites. Construction of roads, pipelines, and other facilities must comply with direction in the Forest Plan.

Exception: None

Modification: A modification may be granted if a portion of the developed recreation sites in the leasehold are moved or eliminated.

Waiver: A waiver may be granted if all the developed recreation site(s) in the leasehold are moved or eliminated.

NSO – 16

NO SURFACE OCCUPANCY STIPULATION – 17
Other Resources: Research Natural Areas

No Surface Occupancy in Research Natural Areas

Where: Within the boundary of all Research Natural Areas.

For the Purpose Of: Protecting the characteristics, function, and intended use of these lands.

Exception: None

Modification: None

Waiver: None

NSO – 17

NO SURFACE OCCUPANCY STIPULATION – 18
Other Resources: Forest Service Administrative Sites and Facilities

No Surface Occupancy for Administrative Sites

Where: Within ¼ mile of Forest Service administrative sites.

For the Purpose Of: Protecting the capital investment and uses associated with administrative sites. Construction of roads, pipelines, and other facilities must comply with direction in the Forest Plan.

Exception: None

Modification: A modification may be granted if a portion of the administrative site(s) in the leasehold are moved or eliminated.

Waiver: A waiver may be granted if all the administrative site(s) in the leasehold are moved or eliminated.

NO SURFACE OCCUPANCY STIPULATION – 19
Other Resources: Cultural Resources; Old Spanish Trail, Paradise Valley, Quitchupah Canyon

No Surface Occupancy in Old Spanish Trail Corridor

Where: Within the boundary of the Old Spanish Trail corridor delineated and mapped by the Forest Service.

For the Purpose Of: Protecting the integrity of the trail and the viewshed along the corridor.

Exception: None

Modification: None

Waiver: None

No Surface Occupancy in Paradise Valley Cultural Resource Site

Where: Within the boundary containing a high density of recorded cultural resource sites in Paradise Valley, delineated and mapped by the Forest Service.

For the Purpose Of: Protecting the cultural resources in this area containing an unusually high density of recorded sites.

Exception: None

Modification: None

Waiver: None

No Surface Occupancy in Quitchupah Canyon Cultural Area

Where: Within the boundary of Quitchupah Canyon Cultural Area.

For the Purpose Of: Protecting the cultural use and values of these lands.

Exception: None

Modification: None

Waiver: None

CONTROLLED SURFACE USE STIPULATION – 01
Wildlife and Plant Species: Goshawk PFAs

Controlled Surface Use in Goshawk Post Fledgling Areas (PFA)

Where: Within goshawk PFAs delineated and mapped by the Forest Service.

For the purpose of: Providing for goshawk fledgling survivorship by maintaining solitude and ambient noise levels during the fledgling period within the PFA.

Surface occupancy or use is subject to the following special operating constraints:

Prior to any surface disturbing activity in a goshawk PFA, a two-year protocol survey would be required and would need to be completed between March 1 and September 30. If any occupied or active nests are found within the PFA, high intensity oil and gas activities such as construction and drilling will be restricted in the area of the PFA from 1 March to 30 September or until birds have fledged as determined by Forest Service wildlife staff.

Exception: None

Modification: None

Waiver: None

CSU – 01

CONTROLLED SURFACE USE STIPULATION – 02
Wildlife and Plant Species: Active Raptor Nests

Controlled Surface Use for Active Raptor Nests

Where: Within the influence zone of affected raptor species as determined by guidelines set forth by the US Fish and Wildlife Service.

For the purpose of: Protecting nesting raptors and their young.

Surface occupancy or use is subject to the following special operating constraints:

Raptor nest surveys are required in potentially suitable habitats for all raptors, including Threatened, Endangered, Sensitive and MIS species prior to the approval of surface disturbing activities at a specific location.

If active or occupied raptor nests are located, high intensity activities such as construction and drilling will be restricted surrounding the nest(s) within an influence zone. Influence zones and duration of restrictions would depend on the raptor species of concern as determined in the guidelines set forth by the US Fish and Wildlife Service for Utah species. Influence zones are line-of-sight to specified distances. If topography or vegetation provides adequate screening needed to maintain nest viability, the distance may be reduced (to be determined by the Fishlake National Forest wildlife biologist).

For the purpose of: Protecting nesting raptors by maintaining solitude and ambient noise levels during the nesting season.

To provide protections to golden eagles beyond the Bald and Golden Eagle Protection Act by avoiding injury or mortality to nestlings and adults (take) through spatial and seasonal buffers.

Exception: None

Modification: None

Waiver: None

CSU – 02

CONTROLLED SURFACE USE STIPULATION – 03
Other Resources: Air Quality

Controlled Surface Use for Class I Airsheds

Where: For exploratory projects on all lands within 5 km of Class I airsheds and for development and production projects on all lands in within 60 km of Class I airsheds.

For the purpose of: Protection of air resources in and around Class I areas to meet or exceed FLAG guidelines.

On all lands in within 60 km of Class I airsheds, surface occupancy or use is subject to the following special operating constraints:

Proposed operations must be located and/or designed to not cause or contribute to adverse impacts to air quality related values in Class I airsheds. Operators will be expected to use appropriate Best Available Control Technology (BACT) to reduce impacts to air quality and air quality related values by reducing emissions from field production and operations. The future development of the lease parcels may be subject to appropriate mitigation and conditions of approval (COAs) to reduce or mitigate air resource impacts and GHG emissions.

To ensure this, within 5 km for exploratory projects and within 60km for development and production projects of any Class I airshed an air impact analysis would be required prior to any field activity to demonstrate that proposed operations and associated mitigating measures will not result in an exceedances of the air standards as outlined in the most recent FLAG guidance.

Typical design and mitigation measures may include: use of Tier IV or better engines, use of low sulfur fuels, electrification of well fields, flaring hydrocarbon and gases at high temperatures in order to reduce emissions of incomplete combustion; water dirt roads during periods of high use in order to reduce fugitive dust emissions; require that vapor recovery systems be maintained and functional in areas where petroleum liquids are stored; minimize roads and re-vegetate areas of the pad not required for production facilities to reduce the amount of dust from the pads.

Exception: None

Modification: None

Waiver: None

CSU – 03

TIMING LIMITATION – 01
Wildlife and Plant Species: Bighorn Sheep Lambing Areas, Crucial Elk Calving and Mule Deer Fawning Habitat

Timing Limitation for Bighorn Sheep Lambing Areas, Crucial Elk Calving and Mule Deer Fawning Habitat

Where: Within potential bighorn sheep lambing areas modeled and mapped by the Forest Service, and crucial elk calving and mule deer fawning habitat delineated and mapped by UDWR.

No activities would be allowed during the critical time period May 1 to July 5.

For the Purpose Of: Protecting lambing areas and crucial elk calving and mule deer fawning habitat by precluding activities which could cause increased stress and/or displacement.

Exception: An exception may be granted if there are no practical alternatives, and the Forest Supervisor determines through analysis, and in coordination with the Utah Division of Wildlife Resources that the nature of the actions, as proposed or conditioned, could be fully mitigated.

Modification: None

Waiver: None

TIMING LIMITATION – 02
Wildlife and Plant Species: Crucial Elk and Mule Deer Winter Range

Timing Limitation for Crucial Elk and Mule Deer Winter Range

Where: Within crucial elk and mule deer winter range delineated and mapped by UDWR.

No activities would be allowed during the critical time period December 1 to April 15.

For the Purpose Of: Protecting crucial elk and mule deer winter range by precluding activities which could cause increased stress and/or displacement.

Exception: An exception may be granted if there are no practical alternatives, and the Forest Supervisor determines through analysis and in coordination with the Utah Division of Wildlife Resources that the nature of the actions, as proposed or conditioned, could be fully mitigated. This might occur if seasonal conditions are such that the animals have moved and are not using the specified area during the time they would normally be expected. Factors to be considered would include elk presence or expected elk presence, snow depth, temperature, snow crusting, location of disturbance, forage quantity and quality, animal condition, and expected duration of disturbance.

Modification: A modification may be granted if the Forest Supervisor determines through new habitat studies, coordinated with the Utah Division of Wildlife Resources, that a portion of the leasehold affected by this stipulation does not contain crucial elk winter range.

Waiver: None

TIMING LIMITATION – 03
Wildlife and Plant Species: Bighorn Sheep Winter Range

Timing Limitation for Bighorn Sheep Winter Range

Where: Within potential bighorn sheep winter range modeled and mapped by the Forest Service.

No activities would be allowed during the critical time period November 1 to April 15.

For the Purpose Of: Protecting bighorn sheep winter range by precluding activities which could cause increased stress and/or displacement.

Exception: An exception may be granted if there are no practical alternatives, and the Forest Supervisor determines through analysis and in coordination with the Utah Division of Wildlife Resources that the nature of the actions, as proposed or conditioned, could be fully mitigated. This might occur if seasonal conditions are such that the animals have moved and are not using the specified area during the time they would normally be expected.

Modification: A modification may be granted if the Forest Supervisor determines through new habitat studies, coordinated with the Utah Division of Wildlife Resources, that a portion of the leasehold affected by this stipulation does not contain bighorn sheep winter range.

Waiver: None

TIMING LIMITATION – 04
Wildlife and Plant Species: Greater Sage Grouse Brood-rearing Habitat

Timing Limitation for Sage Grouse Brood-rearing Habitat

Where: Within sage grouse brood-rearing habitat delineated and mapped by UDWR.

No activities would be allowed during the period May 1 through July 5.

For the Purpose Of: Protecting sage grouse during the critical breeding season by precluding activities which could cause increased stress, displacement, and/or breeding failures.

Exception: An exception may be granted if the Forest Supervisor, in coordination with the Utah Division of Wildlife Resources, determines through analysis that the nature of the actions, as proposed or conditioned, could be fully mitigated.

Modification: A modification may be granted if the Forest Supervisor determines through coordination with the Utah Division of Wildlife Resources, that new habitat studies demonstrate a portion of the lease area affected by this stipulation no longer contains brood-rearing habitat.

Waiver: A waiver may be granted if the Forest Supervisor determines through coordination with the Utah Division of Wildlife Resources, that new habitat studies demonstrate the entire lease area affected by this stipulation no longer contains brood-rearing habitat.

TL – 04

TIMING LIMITATION – 05
Wildlife and Plant Species: Greater Sage Grouse Winter Habitat

Timing Limitation for Sage Grouse (Structures in Winter Habitat)

Where: Within sage grouse winter habitat delineated and mapped by UDWR.

For the Purpose Of: Protecting wintering sage grouse from predation, habitat fragmentation, and disturbance during the critical period from December 1 to March 15.

Exception: An exception may be granted if the Forest Supervisor, in coordination with the Utah Division of Wildlife Resources, determines through analysis that the nature of the actions, as proposed or conditioned, could be fully mitigated.

Modification: A modification may be granted if the Forest Supervisor determines through consultation with the U.S. Fish and Wildlife Service and coordination with the Utah Division of Wildlife Resources, that new habitat studies demonstrate a portion of the lease area affected by this stipulation no longer contains winter habitat.

Waiver: A waiver may be granted if the Forest Supervisor determines through coordination with the Utah Division of Wildlife Resources, that new habitat studies demonstrate the entire lease area affected by this stipulation no longer contains winter habitat.

TL – 05

Lease Notices for Oil and Gas Development on
Lands Administered by the Fishlake National Forest
Under Jurisdiction of
Department of Agriculture

In conducting operations associated with this lease, the lessee/operator must comply with all the rules and regulations of the Secretary of Agriculture set forth at Title 36, Chapter II, of the Code of Federal Regulations governing the use, occupancy, and management of National Forest System (NFS) lands when not inconsistent with existing lease rights granted by the Secretary of Interior.

All matters related to this notice are to be addressed to:

Forest Supervisor
Fishlake National Forest
115 E. 900 N.
Richfield, Utah 84701
Telephone: **435 896-9233**

who is the authorized representative of the Secretary of Agriculture.

CULTURAL RESOURCES (National Historic Preservation Act of 1966 (NHPA), P.L. 89-665 as amended by P.L. 94-422, P.L. 94-458, and P.L. 96-515):

The Forest Service authorized officer is responsible for ensuring that the leased lands are examined prior to the undertaking of any ground-disturbing activities to determine whether or not cultural resources are present, and to specify mitigation measures for effects on cultural resources that are found to be present.

The lessee or operator shall contact the Forest Service to determine if a site-specific cultural resource inventory is required prior to undertaking any surface-disturbing activities on Forest Service lands covered by this lease.

The lessee or operator may engage the services of a cultural resource specialist acceptable to the Forest Service to conduct any necessary cultural resource inventory of the area of proposed surface disturbance. In consultation with the Forest Service authorized officer, the lessee or operator may elect to conduct an inventory of a larger area to allow for alternative or additional areas of disturbance that may be needed to accommodate other resource needs or operations.

The lessee or operator shall implement mitigation measures required by the Forest Service to preserve or avoid destruction of cultural resource values. Mitigation may include relocation of proposed facilities, testing, salvage, and recordation or other protective measures.

During the course of actual surface operations on Forest Service lands associated with this lease, the lessee or operator shall immediately bring to the attention of the Forest Service the discovery of any cultural or paleontological resources. The lessee or operator shall leave such discoveries intact until directed to proceed by Forest Service.

THREATENED OR ENDANGERED SPECIES (The Endangered Species Act. (ESA), P.L. 93-205 (1973), P.L. 94-359 (1974), P.L. 95-212 (1977), P.L. 95-632 (1978), P.L. 96-159 (1979), P.L. 97-304 (1982), P.L. 100-653 (1988)).

The Forest Service authorized officer is responsible for compliance with the Endangered Species Act. This includes meeting ESA Section 7 consultation requirements with the U.S. Fish and Wildlife Service prior to any surface disturbing activities associated with this lease with potential effects to species and/or habitats protected by the ESA. The results of consultation may indicate a need for modification of or restrictions on proposed surface disturbing activities.

The lessee or operator may choose to conduct the examination at their cost. Results of the examination will be used in any necessary ESA consultation procedures. This examination and any associated reports, including Biological Assessments, must be done by or under the supervision of a qualified resource specialist approved by the Forest Service. Any reports must also be formally approved by the USDA Forest Service biologist or responsible official.

LEASE NOTICE – Mexican Spotted Owl:

The Lessee/Operator is given notice that the lands in this lease contain suitable habitat for Mexican spotted owl, a federally listed species. Insert the following if lease contains Designated Critical Habitat: [The Lessee/Operator is given notice that the lands in this lease contain Designated Critical Habitat for the Mexican spotted owl, a federally listed species. Critical habitat was designated for the Mexican spotted owl on August 31, 2004 (69 FR 53181-53298).] Avoidance or use restrictions may be placed on portions of the lease. Application of appropriate measures will depend on if the action is temporary or permanent, and whether it occurs within or outside the owl nesting season. A temporary action is completed prior to the following breeding season leaving no permanent structures and resulting in no permanent habitat loss. A permanent action continues for more than one breeding season and/or causes a loss of owl habitat or displaces owls through disturbances, i.e. creation of a permanent structure.

The following avoidance and minimization measures have been designed to ensure activities carried out on the lease are in compliance with the Endangered Species Act. Integration of and adherence to these measures will facilitate review and analysis of any submitted permits under the authority of this lease. Following these measures could reduce the scope of ESA Section 7 consultation at the permit stage.

Current avoidance and minimization measures include the following:

1. Surveys following Forest Service approved protocol will be required prior to operations unless species occupancy and distribution information is complete and available. All surveys must be conducted by qualified individual(s).
2. Assess habitat suitability for both nesting and foraging using accepted habitat models in conjunction with field reviews. Apply the conservation measures below if project activities occur within 0.5 mile of suitable owl habitat. Determine potential effects of actions to owls and their habitat. Document type of activity, acreage and location of direct habitat impacts, type and extent of indirect impacts relative to location of suitable owl habitat. Document if action is temporary or permanent.

3. Lease activities will require monitoring throughout the duration of the project. To ensure desired results are being achieved, minimization measures will be evaluated and, if necessary, Section 7 consultation reinitiated.
4. Produced water will be managed to ensure maintenance or enhancement of riparian habitat.
5. Where technically and economically feasible, use directional drilling or multiple wells from the same pad to reduce surface disturbance and eliminate drilling in canyon habitat suitable for Mexican spotted owl nesting.
6. For all temporary actions that may impact owls or suitable habitat:
    a. If the action occurs entirely outside of the owl breeding season (March 1- August 31), and leaves no permanent structure or permanent habitat disturbance, action can proceed without an occupancy survey.
    b. If action will occur during a breeding season, survey for owls prior to commencing activity. If owls are found, consultation with USFWS must be reinitiated and activity must be delayed until consultation is completed.
    c. Rehabilitate access routes created by the project through such means as raking out scars, revegetation, gating access points, etc.
7. For all permanent actions that may impact owls or suitable habitat:
    a. Survey two consecutive years for owls according to accepted protocol prior to commencing activities.
    b. If owls are found, no actions will occur within 0.5 mile of identified nest site. If nest site is unknown, no activity will occur within the designated Protected Activity Center (PAC).
    c. Avoid drilling and permanent structures within 0.5 mi of suitable habitat unless surveyed and not occupied.
    d. Reduce noise emissions (e.g., use hospital-grade mufflers) to 45 dBA at 0.5 mile from suitable habitat, including canyon rims. Placement of permanent noise- generating facilities should be determined by a noise analysis to ensure noise does not encroach upon a 0.5 mile buffer for suitable habitat, including canyon rims.
    e. Limit disturbances to and within suitable habitat by staying on approved routes.
    f. Limit new access routes created by the project.

Additional measures to avoid or minimize effects to the species may be developed and implemented in consultation with the U.S. Fish and Wildlife Service between the lease sale stage and lease development stage to ensure continued compliance with the Endangered Species Act.

LEASE NOTICE – California Condor:

The Lessee/Operator is given notice that the lands located in this parcel contain potential habitat for the California condor, a federally listed species. Avoidance or use restrictions may be placed on portions of the lease if the area is known or suspected to be used by condors. Application of appropriate measures will depend on whether the action is temporary or permanent, and whether it occurs within or outside potential habitat. A temporary action is completed prior to the following important season of use, leaving no permanent structures and resulting in no permanent habitat loss. This would include consideration for habitat functionality. A permanent action continues for more than one season of habitat use, and/or causes a loss of condor habitat function or displaces condors through continued disturbance (i.e. creation of a permanent structure requiring repetitious maintenance, or emits disruptive levels of noise).

The following avoidance and minimization measures have been designed to ensure activities carried out on the lease are in compliance with the Endangered Species Act. Integration of and adherence to these measures will facilitate review and analysis of any submitted permits under the authority of this lease. Following these measures could reduce the scope of Endangered Species Act, Section 7 consultation at the permit stage.

Current avoidance and minimization measures include the following:

1. Surveys will be required prior to operations unless species occupancy and distribution information is complete and available. All Surveys must be conducted by qualified individual(s) approved by the Forest Service, and must be conducted according to approved protocol.
2. If surveys result in positive identification of condor use, all lease activities will require monitoring throughout the duration of the project to ensure desired results of applied mitigation and protection. Minimization measures will be evaluated during development and, if necessary, Section 7 consultation may be reinitiated.
3. Temporary activities within 1.0 mile of nest sites will not occur during the breeding season.
4. Temporary activities within 0.5 miles of established roosting sites or areas will not occur during the season of use, August 1 to November 31, unless the area has been surveyed according to protocol and determined to be unoccupied.
5. No permanent infrastructure will be placed within 1.0 mile of nest sites.
6. No permanent infrastructure will be placed within 0.5 miles of established roosting sites or areas.
7. Lessee is responsible to remove big game carrion (which may be an unwanted attractant) to 100 feet from on lease roadways occurring within foraging range as feasible in coordination with the UDWR and the Forest Service.

Where technically and economically feasible, use directional drilling or multiple wells from the same pad to reduce surface disturbance and eliminate drilling in suitable habitat.

Additional measures may also be employed to avoid or minimize effects to the species between the lease sale and lease development stages. These additional measures will be developed and implemented in consultation with the U.S. Fish and Wildlife Service to ensure continued compliance with the Endangered Species Act.

LEASE NOTICE – Western Yellow-billed Cuckoo:

The Lessee/Operator is given notice that the lands located in this parcel contain potential habitat for the Western yellow-billed cuckoo, a federally listed species. In areas that contain riparian habitat within the range of the species, actions that may cause stress and disturbance during nesting and rearing of young would be avoided or restricted. Appropriate measures will depend on if the action is temporary or permanent, and whether it occurs within or outside the nesting season. A temporary action is completed prior to the breeding season leaving no permanent structures and resulting in no permanent habitat loss. A permanent action continues for more than one breeding season and/or causes a loss of habitat or displaces individuals through disturbances. Current avoidance and minimization measures include the following:

1. Surveys would be required prior to operations unless species occupancy and distribution information is complete and available. All surveys must be conducted by qualified individual(s) and be conducted according to protocol.

2. Activities would require monitoring throughout the duration of the project. To ensure desired results are being achieved, minimization measures would be evaluated and, if necessary, Section 7 consultation reinitiated.
3. Water production would be managed to ensure maintenance or enhancement of riparian habitat.
4. Where technically and economically feasible, use directional drilling or multiple wells from the same pad to reduce surface disturbance and eliminate drilling in suitable riparian habitat. Ensure that such directional drilling does not intercept or degrade alluvial aquifers.
5. Activities would maintain a 300 feet buffer from suitable riparian habitat year long.
6. Activities within ¼ mile of occupied breeding habitat would not occur during the breeding season of May 1 to August 15.
7. Ensure that water extraction or disposal practices do not result in change of hydrologic regime that would result in loss or degradation of riparian habitat.
8. Re-vegetate with native species all areas of surface disturbance within riparian areas and/or adjacent land.

Additional measures to avoid or minimize effects to the species may be developed and implemented in consultation with the USFWS between the lease sale stage and lease development stage to ensure continued compliance with the ESA.

LEASE NOTICE – Migratory Birds:

The lessee/operator is given notice that surveys for nesting migratory birds may be required during migratory bird breeding season whenever surface disturbances and/or occupancy is proposed in association with fluid mineral exploration and development within priority habitats. Surveys should focus on identified priority bird species in Utah. Field surveys will be conducted as determined by the authorized officer of the USDA Forest Service. Based on the result of the field survey, the authorized officer will determine appropriate buffers and timing limitations. This notice may be waived, excepted, or modified by the authorized officer if either the resource values change or the lessee/operator demonstrates that adverse impacts can be mitigated.

LEASE NOTICE - Sensitive and MIS Species (Plants and Wildlife):

The Lessee/Operator is given notice that the lands in this parcel contain suitable habitat for sensitive, and/or management indicator species. The following avoidance and minimization measures have been developed to facilitate locating and designing operations to avoid adverse effects to the viability of these species.

Prior to conducting any surface disturbing activities within suitable habitat for sensitive and Management Indicator Species (MIS), surveys would need to be completed. If sensitive or MIS are found, ground disturbing activities may be moved up to ½ mile to buffer around occupied habitat that is essential to the persistence of the species on the Fishlake and Dixie National Forests.

LEASE NOTICE - Utah Prairie Dog:

The lessee/operator is given notice that lands in this lease may contain historic and/or occupied Utah prairie dog habitat, a threatened species under the Endangered Species Act. Avoidance or use restrictions may be placed on portions of the lease. Application of appropriate measures will depend whether the action is temporary or permanent, and whether it occurs when prairie dogs are active or hibernating. A temporary action is completed prior to the following active season leaving no permanent structures and resulting in no permanent habitat loss. A permanent action continues for more than one activity/hibernation season and/or causes a loss of Utah prairie dog habitat or displaces prairie dogs through disturbances, i.e. creation of a permanent structure.

The following avoidance and minimization measures have been designed to ensure activities carried out on the lease are in compliance with the Endangered Species Act. Integration of, and adherence to these measures will facilitate review and analysis of any submitted permits under the authority of this lease. Following these measures could reduce the scope of Endangered Species Act, Section 7 consultation at the permit stage.

Current avoidance and minimization measures include the following:

1. Surveys will be required prior to operations unless species occupancy and distribution information is complete and available. All Surveys must be conducted by qualified individual(s) approved by the Forest Service (i.e., needs to have passed the USFWS Utah Prairie Dog survey course).
2. Lease activities will require monitoring throughout the duration of the project. To endure desired results are being achieved, minimization measures will be evaluated and, if necessary, Section 7 consultation reinitiated.
3. Where technically and economically feasible, use directional drilling or multiple wells from the same pad to reduce surface disturbance and eliminate drilling in prairie dog habitat.
4. Surface occupancy or other surface disturbing activity will be avoided within 0.5 mile of active prairie dog colonies.
5. Permanent surface disturbance or facilities will be avoided within 0.5 mile of potentially suitable, unoccupied prairie dog habitat, identified and mapped by Utah Division of Wildlife Resources.
6. The lessee/operator should consider if fencing infrastructure on well pad, e.g., drill pads, tank batteries, and compressors, would be needed to protect equipment from burrowing activities. In addition, the operator should consider if future surface disturbing activities would be required at the site.
7. Within occupied habitat, set a 25 mph speed limit on operator-created and access roads and adhere to speed limit on maintained roads. The speed limit may have to be revisited on a site-specific basis and reduced.
8. Limit disturbances to and within suitable habitat by staying on designated routes.
9. Limit new access routes created by the project.
10. Unavoidable impacts to the species will be mitigated through site-specific consultation with the US Fish and Wildlife Service.

Additional measures to avoid or minimize effects to the species may be developed and implemented in consultation with the U.S. Fish and Wildlife Service between the lease sale stage and lease development stage to ensure continued compliance with the Endangered Species Act.

Lease Notice - Drinking Water Source Protection Zones:

The following is required language for approval for Oil and Gas activities with source water protections zones: This lease (or a portion thereof) has been determined to be within a public Drinking Water Source Protection Zone. Prior to any surface-disturbing activity, the lessee/operator must contact the BLM field office and the public water system manager to determine any zoning ordinances, best management or pollution prevention measures, or physical controls that may be required within the protection zone(s). Compliance with Drinking Water Source Protection plans, developed by public water systems under the requirements of R309-600, Drinking Water Source Protection for Ground-Water Sources (Utah

Administrative Code), is mandatory. Compliance with county ordinances to protect the source protection zones, as required by Section 19-4-113 of the Utah Code, is also mandatory.

Some public water sources qualify for monitoring waivers which reduce their monitoring requirements for pesticides and volatile organic chemicals (VOCs). Exploration, drilling, and production activities within Source Protection zones could jeopardize these waivers, thus requiring increased monitoring. The operator must contact the public water system administrator to determine what effect their activities may have on the public water system's monitoring waivers. Compliance with other Utah State rules to protect surface and ground water such as the Utah Division of Water Quality Rule R317 (Water Quality Rules) and Rule R649 (Rules of the Utah Division of Oil, Gas and Mining, Utah Oil and Gas Conservation) is required.

Lease Notice - Drinking Water Source Protection Zone Condition of Approval (COA)

The following is required language for approval for Oil and Gas activities with source water protections zones: This lease (or a portion thereof) has been determined to be within a public Drinking Water Source Protection Zone. Prior to any surface-disturbing activity, the lessee/operator must contact the BLM field office and the public water system manager to determine any zoning ordinances, best management or pollution prevention measures, or physical controls that may be required within the protection zone(s). Compliance with Drinking Water Source Protection plans, developed by public water systems under the requirements of R309-600, Drinking Water Source Protection for Ground-Water Sources (Utah Administrative Code), is mandatory. Compliance with county ordinances to protect the source protection zones, as required by Section 19-4-113 of the Utah Code, is also mandatory.

Some public water sources qualify for monitoring waivers which reduce their monitoring requirements for pesticides and volatile organic chemicals (VOCs). Exploration, drilling, and production activities within Source Protection zones could jeopardize these waivers, thus requiring increased monitoring. The operator must contact the public water system administrator to determine what effect their activities may have on the public water system's monitoring waivers. Compliance with other Utah State rules to protect surface and ground water such as the Utah Division of Water Quality Rule R317 (Water Quality Rules) and Rule R649 (Rules of the Utah Division of Oil, Gas and Mining, Utah Oil and Gas Conservation) is required.

Groundwater Protection Zones 1-4:

This lease (or a portion thereof) is within one or more Drinking Water Source Protection Zones (DWSPZs) designated by the Utah Division of Drinking Water (DDW). Prior to a lease being offered up for sale that overlies a DWSPZ the BLM would attach IM No. UT 2010-055, Attachment F (Utah Drinking Water Source Protection Zone Lease Notice).

BLM's rules and regulations outlined in 43 CFR §3162.4-2, §3162.5-1(a) and §3162.5-2 (d) Control of wells, Onshore Oil and Gas Orders Nos. 2 and 7, and the Gold Book have been developed to address potential impacts to ground water from the drilling and completion of oil and gas wells, including the construction and use of reserve and production pits. Specifically, §3162.5-2 (d) Protection of fresh water and other minerals requires that the operator shall isolate freshwater-bearing and other usable water containing 5,000 ppm or less dissolved solids and Onshore Order No. 2 increases the requirement by establishing a 10,000 ppm total dissolved solids (TDS) threshold for protection of usable water.

Concurrent with submittal of an application for a permit to drill (APD), or any proposed surface disturbing activity, the lessee/operator must provide the BLM Authorized Officer (AO) protective measures, which adequately address protection of the DWSPZ or other usable ground water zones. If operator proposed measures are considered insufficient to adequately protect the water zones, the AO will incorporate additional protective measures as condition(s) of approval (COAs). During further analysis at time of APD approval, the BLM would attach IM No. UT 2010-055, Attachment G (Utah Drinking Water Source Protection Zone COA).

Geophysical logs will be required in order to determine cement integrity and subsequent protection /isolation of usable ground water resources. Upon well completion, additional testing may be required to verify well bore integrity for protection of usable ground water resources. Testing results will be evaluated to determine if effective implementation of mitigation measures has been achieved.

<u>Existing Transient Non-Community Water Systems – Zones T2 and T4</u>:

This lease (or a portion thereof) is within Drinking Water Source Protection Zones designated as a transient non-community water system which does not serve 25 of the same nonresident persons per day for more than 6 months per year by the Utah Division of Drinking Water. The Transient System T2 protection zone for existing wells or springs is the area within a 250-day ground-water time of travel to the wellhead, spring or margin of the collection area, the boundary of the aquifer(s) which supplies water to the ground-water source, or the ground-water divide, whichever is closer. The Transient System T4 protection zone for existing wells or springs is the area within a 10-year ground-water time of travel to the wellhead, spring or margin of the collection area, the boundary of the aquifer(s) which supplies water to the ground-water source, or the ground-water divide, whichever is closer. Compliance with R309-600 is voluntary for existing transient non-community water systems. However, all new ground water sources (including transient non-community systems) must submit to the DDW a Preliminary Evaluation Report (R309-600-13(2)) and a Drinking Water Source Protection Plan (R309-600-7(1)) which designates ground water source protection zones 1 through 4. Protection of the zones T2 and T4 must also comply with LEASE NOTICE – Groundwater Protection Zones 1-4.

<u>Surface Water Protection Zones 1-4:</u>

There currently are no Surface Water Protection Zones within the lands being proposed for leasing. But if any are created then the following Lease Notice for these zones would apply. This lease (or a portion thereof) is within public Drinking Water Source Protection Zones 1, 2, 3, and/or 4. Before application for a permit to drill (APD) submittal or any proposed surface disturbing activity, the lessee/operator must contact the BLM field office and the public water system manager to determine any zoning ordinances, best management or pollution prevention measures or physical controls that may be required within the protection zone. Drinking Water Source Protection plans are developed by the public water systems under the requirements of R309-605-7, Drinking Water Source Protection for Surface Sources (Utah Administrative Code). There may also be county ordinances in place to protect the source protection zones, as required by Section 19-4-113 of the Utah Code.

Incorporated cities and towns may also protect their drinking water sources using Section 10-8- 15 of the Utah Code. Cities and town have the extraterritorial authority to enact ordinances to protect a source of drinking water ... "For 15 miles above the point from which it is taken and for a distance of 300 feet on each side of such stream..." Class I cities (greater than 100,000 population) are granted authority to protect their entire watersheds.

Some public water sources qualify for monitoring waivers which reduce their monitoring requirements for pesticides and volatile organic chemicals (VOCs). Exploration, drilling and production activities within a Source Protection Zone could jeopardize these waivers, thus requiring increased monitoring. Contact the public water system to determine what effect your activities may have on their monitoring waivers. Please be aware of other state rules to protect surface and ground water, including Utah Division of Water Quality Rules R317 Water Quality Rules; and Rules of the Utah Division of Oil, Gas and Mining, Utah Oil and Gas Conservation Rules R649.

During further analysis at time of APD the BLM would attach IM No. UT 2010-055, Attachment G - Utah Drinking Water Source Protection Zone COA.

At the time of development, drilling operators will additionally conform to the BLM operational regulations and Onshore Oil and Gas Order No. 7 (which prescribes measures required for the handling of produced water to ensure the protection of surface and ground water sources) and the Surface Operating Standards and Guidelines for Oil and Gas Development, The Gold Book, Fourth Edition-Revised 2007 (which provides information and requirements for conducting environmentally responsible oil and gas operations).

<u>Sole Source Aquifers</u>

There currently are no Sole Source Aquifers within the lands being proposed for leasing. But if any are created then the following Lease Notice for these zones would apply. This lease (or a portion thereof) is within Sole Source Aquifer Protection zone designated by the Environmental Protection Agency (EPA). BLM's rules and regulations outlined in 43 CFR §3162.4-2, §3162.5-1(a) and §3162.5-2 (d) Control of wells, Onshore Oil and Gas Orders Nos. 2 and 7, and the Gold Book have been developed to address potential impacts to ground water from the drilling and completion of oil and gas wells, including the construction and use of reserve and production pits. Specifically, §3162.5-2 (d) Protection of fresh water and other minerals requires that the operator shall isolate freshwater-bearing and other usable water containing 5,000 ppm or less dissolved solids and Onshore Order No. 2 increases the requirement by establishing a 10,000 ppm total dissolved solids (TDS) threshold for protection of usable water.

During further analysis at time of APD the BLM would attach IM No. UT 2010-055, Attachment G - Utah Drinking Water Source Protection Zone COA.

Concurrent with submittal of an application for a permit to drill (APD), or any proposed surface-disturbing activity, the lessee/operator must provide the BLM Authorized Officer (AO) protective measures, which adequately address protection of the Sole Source Aquifer and other usable ground water zones. If operator proposed measures are considered insufficient to adequately protect the water zones, the AO will incorporate additional protective measures as condition(s) of approval (COAs).

Geophysical logs will be required in order to determine cement integrity and subsequent protection/isolation of usable ground water resources. Upon well completion, additional testing may be required to verify well bore integrity for protection of usable ground water resources. Testing results will be evaluated to determine if effective implementation of mitigation measures has been achieved.

Floodplains and Wetland (EO 11988; EO 11990):

The lessee is hereby notified that this lease may contain land within a riparian or wetland ecosystem.

All activities within this area may be precluded or highly restricted in order to comply with Executive Order 11988 - Floodplain Management and Executive Order 11990 - Protection of Wetlands, in order to preserve and restore or enhance the natural and beneficial values served by floodplains and wetlands.

Occupancy and use of lands within riparian or wetland areas, as proposed in a Surface Use Plan of Operations, will be considered in an environmental analysis and mitigation measures deemed necessary to protect these areas identified. These areas are to be avoided to the extent possible, or special measures such as road design, well pad size and location or directional drilling, may be made part of the permit authorizing the activity.

LEASE NOTICE - Air Resources: (Clean Air Act of 1963, as amended by P.L. 90-148, P.L. 91-604, and P.L. 101-549; National and State of Utah Ambient Air Quality Standards, National Standards of Performance for New Stationary Sources, National Prevention of Significant Deterioration Standards, National Emissions Standards for Hazardous Air Pollutants, Utah Air Conservation Regulations (R446), and Utah State Implementation Plan)

1. The operator shall comply with the following practices to control impacts to ambient air quality from oil and gas exploration and production activities:

    a. As appropriate, quantitative analysis of potential air quality impacts will be conducted for project-specific developments by the operator, in concert with direction from the Utah Department of Environmental Quality, Division of Air Quality (UDAQ), the Forest Service and cooperating federal land management agencies including but not limited to the National Park Service. The Forest Service will notify cooperating agencies as project specific proposals are received and additional air impact analyses are performed to ensure input from those agencies. Additional project specific air impact analyses would need to be conducted if the following project criteria are fulfilled:

        i. If an exploration drilling project is proposed within 5km of an adjacent Class I area, air quality related value (AQRV) impacts would need to be addressed utilizing at a minimum the VISCREEN screening tool. Additional air impact analyses may be necessary based on the review of the initial VISCREEN analysis.

        ii. If an oil and gas production project is proposed at a distance of over 60km from an adjacent Class I area and has emissions that exceed those utilized in the existing “Fishlake 12-well development scenario", A quantitative air quality impact analysis would need to be conducted for the project that follows the guidance found in the FLAG modeling guidelines.

        iii. If an oil and gas production project is proposed within 60km of an adjacent Class I area and has emissions that equal or exceed those utilized in the existing “Fishlake 12-well development scenario", a quantitative air quality impact analysis would need to be conducted for the project that follows the guidance found in the FLAG modeling guidelines.

iv. If an exploratory drilling or oil and gas development project is proposed to occur within 60km of an adjacent Class I area and has emissions that are greater than those utilized in the existing "exploratory drilling scenario" but less than those utilized in the "Dixie 20-well development scenario", consultation with the Forest Service and cooperating Federal Agencies would be required to determine an appropriate assessment of air quality impacts. The level of additional analysis would be predicated on the size of the proposed project.

b. Compliance with Utah Air Conservation (UAC) Regulation R446-1 would be necessary. The best air quality control technology, as per guidance from the UDAQ, will be applied to actions as needed to meet air quality standards.

c. The operator will comply with UAC Regulation R446-1-4.5.3, which prohibits the use, maintenance, or construction of roadways without taking appropriate dust abatement measures. Compliance will be obtained through special stipulations as a requirement on new projects and through the use of dust abatement control techniques in problem areas.

d. The operator will manage authorized activities to maintain air quality within the thresholds established by the State of Utah Ambient Air Quality Standards and to ensure that those activities continue to keep the area in attainment, meet prevention of significant deterioration (PSD) Class II standards, and protect the Class I air shed of the National Parks (e.g. Zion, Bryce Canyon, and Capitol Reef National Parks).

e. National Ambient Air Quality Standards will be enforced by the UDEQ, with EPA oversight. Special requirements to reduce potential air quality impacts will be considered on a case-by-case basis in processing land-use authorizations.

f. The operator will utilize BMPs and site specific mitigation measures, when appropriate, based on-site specific conditions, to reduce emissions and enhance air quality.

Examples of these types of measures can be found in the Four Corners Air Quality Task Force Report of Mitigation Options, November 1, 2007; EPA Natural Gas STAR Program

(http://www.epa.gov/gasstar/); and US Forest Service Emission Reduction Techniques for Oil and Gas activities 2011 (http://www.fs.fed.us/air/documents/EmissionReduction- 010711x.pdf).

g. The operator will comply with a Condition of Approval for Applications for Permit to Drill, which includes:

(1) All new and replacement internal combustion diesel fired drilling engines must meet or exceed Tier II emissions limits as codified in 40 CFR Part 89 -"Control of Emissions From New and In-Use Nonroad Compression-Ignition Engines".

2. All new and replacement internal combustion diesel fired well pump engines must meet or exceed Tier II emissions limits for Particulate Matter and Tier III emissions limits for Oxides of Nitrogen and Carbon Monoxide as codified in 40 CFR Part 89 - "Control of Emissions From New and In-Use Nonroad Compression-Ignition Engines".

3. All new and replacement spark ignited natural gas fired internal combustion well-pump engines must meet or exceed emissions limits for Oxides of Nitrogen, Carbon Monoxide and Volatile Organic Compounds from New Source Performance Standard Subpart JJJJ for Stationary Spark Ignition Internal Combustion Engines manufactured since 2008.

4. All new and replacement internal combustion gas field engines of less than or equal to 300 design-rated horsepower must not emit more than 2 grams of NOx per horsepower-hour. (This requirement does not apply to gas field engines of less than or equal to 40 designated horsepower).

5. All new and replacement internal combustion gas field engines of greater than 300 design rated horsepower must not emit more than 1.0 grams of NOx per horsepower-hour.

6. All diesel fuel fired internal combustion engines must utilize certified Ultra Low Sulfur Diesel fuel with a maximum sulfur content of 15 parts per million (PPM).

a. Lease holders will need to conduct detailed volatile organic compound (VOC) emissions inventories for any proposed facilities to provide necessary data to the BLM Utah State Office for their regional photochemical modeling.

b. Lease holders will need to examine the use of additional mitigations for ozone precursors.